

# **SWIFT FOX CONSERVATION TEAM**

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**2000 ANNUAL REPORT**

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**and**

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## Overview

Schmitt, C. Gregory and Bob Oakleaf, eds. 2001. 2000 Swift fox conservation team annual report.

Personnel from state and selected federal land management and wildlife agencies have met annually since 1994 as representatives of the Swift Fox Conservation Team (SFCT) to report on research and management activities on the swift fox within the 10 states that comprise the historic range of this species. Research and management projects and activities conducted by members and cooperators of the SFCT have generally followed goals and objectives presented in the Conservation Assessment and Conservation Strategy for the Swift Fox in the United States. Information compiled by state wildlife agencies, federal land management and wildlife agencies, and other cooperators of the SFCT have been compiled in annual reports. This document represents the sixth annual report of the SFCT.

Based on reexamination of threats to the swift fox and an analysis of the five factors under section 4(a)(1) of the Endangered Species Act, the U. S. Fish and Wildlife Service (Service) determined that the swift fox was not likely to become in danger of extinction throughout all or a significant portion of its range in the foreseeable future. The Service determined that the petitioned action was not warranted and removed the swift fox from the candidate list (Federal Register: January 8, 2001, Volume 66, Number 5, pages 1295-1300). Information used by the Service in their reexamination of threats to the swift fox was to a large degree, based on new information collected and made available by the collective efforts of the SFCT and cooperating entities.

Regardless of the removal of the swift fox from the candidate list, members of the SFCT remain committed to the objectives identified in the Conservation Assessment and Conservation Strategy for Swift Fox in the United States (Kahn, R., L. Fox, P. Horner, B. Giddings, and C. Roy. 1997. Conservation assessment and conservation strategy for swift fox in the United States. 54 pp.). In response to removal of the swift fox from the candidate list, the SFCT sent a letter requesting information from state wildlife agencies and other management and conservation agencies on their commitments and support for future work on the swift fox as described in the swift fox conservation assessment and conservation strategy. The four specific items addressed in this letter were as follows: 1) a brief description of swift fox projects scheduled for the near future, 2) a brief description of long term monitoring plans, 3) a statement of continuing participation in Swift Fox Conservation Team efforts and support thereof, and 4) an acknowledgment of the need for continued monitoring and management of the swift fox with the goal of the species' conservation. This letter was sent to each director of the 10 state wildlife agencies within the range of the swift fox (Montana, Wyoming, Colorado, New Mexico, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas) as well as the following federal agencies: U. S. Forest Service, U. S. Fish and Wildlife Service, Bureau of Land Management, U. S. National Park Service, U. S. Geological Survey, Northern Prairie Wildlife Research Center, and USDA APHIS Wildlife Services. Copies of letters from agency responses to this request are included in the 2000 annual report following the minutes.

**SWIFT FOX CONSERVATION TEAM  
2000 ANNUAL COORDINATION MEETING**

JANUARY 23-24, 2001  
WYNDHAM HOTEL  
ALBUQUERQUE, NEW MEXICO

Meeting was called to order at 12:05 pm.

In attendance were (names in bold indicate Team representatives or their surrogates): **Julianne Hoagland**, Oklahoma Department of Wildlife Conservation; **Eileen Dowd Stukel**, South Dakota Game, Fish and Parks; **Robert Sullivan**, Texas Parks and Wildlife Department; **Greg Schmitt**, New Mexico Department of Game and Fish; **Bob Oakleaf**, Wyoming Game and Fish Department; **Christiane Roy**, Kansas Wildlife and Parks; **Richard Bischof**, Nebraska Game and Parks Commission; **Eric Lawton**, BLM; **Bob Hodorff**, US Forest Service (USFS) National Grasslands; **Pete Gober**, USFWS (for Dave Allardyce); **Steve Fairaizl**, APHIS-Wildlife Services; **Dan Licht**, National Park Service; Chuck Hayes, New Mexico Dept. of Game and Fish; Robert Harrison, University of New Mexico; Lu Carbyn, Canadian Wildlife Service; Kyran Kunkel, Turner Endangered Species Fund; Minette Johnson, Defenders of Wildlife; Jan Kamler, Texas Tech. University; Greg Schroeder, National Park Service; Jerry Dragoo Museum Southwestern Biology.

Team members not present: **Brian Giddings**, Montana Fish, Wildlife and Parks; **Darren Brunning**, North Dakota Game and Fish Department; **Jennie Slater**, Colorado Division of Wildlife; **Marsha Sovada**, USGS Biological Resources Division, Northern Prairie Wildlife Research Center; **Steve Brechtel**, Alberta Fish and Wildlife Division.

### **State and Federal Agency Reports**

#### **Kansas**

Christiane Roy - finished third year of the track search survey last year and results have already been reported. Will be going into a monitoring program with monitoring being conducted once every five years. Currently working on the research data and preparing publications. Kansas has also discussed stopping the swift fox pelt tagging, but opted to continue the program as per the swift fox Conservation Strategy.

#### **Montana**

Brian Giddings - The Montana portion of the Canadian/Montana census was funded by the National Fish and Wildlife Foundation through a Bureau of Land Management Challenge Grant. Montana Fish, Wildlife and Parks is conducting the work through this cost-share project with the BLM. Live-trapping has been very successful. This census should provide an answer regarding the question of swift fox population viability, at least

in the northern portion of the range. The study design being used could be used in other portions of the range as well. In addition to the swift fox census, part of the NFWF grant money will be used to continue with the second and third years of our statewide distribution survey, using the Kansas track search survey method, in the fall of 2001 and 2002.

#### Nebraska

Richard Bischof - furbearer/nongame position with the agency remained vacant for one year following Frank Andelt's resignation. Richard started with this position in August of this past year. Thus, no surveys were done last year in Nebraska. Believe swift fox densities are low in Nebraska. Had one road kill last year. Landowners protect their foxes and they are working on landowner relations. Wants methods for presence/absence surveys. Asked if aerial surveys for dens are possible, not just looking for holes but for patterns of grasses around the holes. Could be possible during the time when pups would be visible when they first emerge from the dens.

#### New Mexico

Greg Schmitt and Robert Harrison - Currently in year 3 of a section 6 swift fox monitoring study. Purpose of the study is to determine appropriate survey methods. 34 foxes have been radio-collared. Trap/camera re-sight method works well. Scat DNA procedures are coming along. 194 scats have been collected. Optimistic that this method will work in the near future. So far have identified 15 of 56 individuals from 194 field scats. Looking at presence/absence relative abundance, scent stations work best. With stations along transects of 10 stations each, 1 mile between stations and run for 3 nights picks up 95% of the foxes in an area. To detect a 20% change in population, need 65 to 90 transects in an area. But you cannot control the density of transects because of the road system. Therefore the area in which 65 or more transects could be included and still maintain independence of stations is quite large - about the size of one of New Mexico's counties. Use trailing scent which is a mixture of mackerel and cod liver oils and actual mackerel.

#### Oklahoma

Julianne Hoagland - Oklahoma also finished the third year of a section 6 funded track search survey and is planning to also go into a monitoring protocol similar to Kansas. Will spend 2001 field season conducting track searches in different habitat types.

#### South Dakota

Eileen Dowd Stukel - Jon Jenks with South Dakota State University plans to use a video camera set-up on at least two swift fox dens during the upcoming breeding season. This equipment has operated successfully in other research studies in western South Dakota. SDGFP will again attempt to gain access to a large ranch that includes a portion of the range of the Ardmore swift fox population. During 1999 field work, the state was denied access as a result of the black-tailed prairie dog becoming a Candidate species. Once GIS

capabilities are improved within the agency, SDGFP will increase its focus on habitat. Field work for 2001 will primarily include track-searching. Funding sources are needed.

#### Texas

Robert Sullivan - in 5<sup>th</sup> year of a research project looking at effects of coyotes on distribution, productivity, and survival of swift foxes in the Panhandle. Jan Kamler with Texas Tech University has been conducting the research as part of a graduate degree. The overall goal has been to determine the minimum viable population. Because of large proportion of the swift fox range in Texas is privately owned, species management is through incentives. The Landowner Incentives Program (LIP) is including swift fox and prairie dogs into lesser prairie chicken and other short grass prairie system projects. Concerned that funding for research will decline with the removal of the swift fox from the Candidate list.

Jan Kamler - wanted to see if coyote control would impact swift fox numbers. Study area consisted of the Rita Blanca National Grassland in Dallam County and on a private ranch in Sherman County. With two years of data before coyote control and one year of data following control. On National Grassland, found coyotes killing swift fox at den sites. Swift fox are excluded from core areas of coyote home ranges. All juvenile swift fox were killed prior to dispersal. When adult swift fox were killed, another adult moved into the area. Believed the area on the National Grassland was a sink population but developed a surplus of swift fox following coyote control.

The second study area was on fragmented private land with 1/3 of the area center-pivot agriculture, 1/3 CRP, and 1/3 rangeland. Swift fox capture rates declined with increasing fragmentation for 12 to 6 to 1. Coyote control, however, was higher on the private land. Coyote control is in the form of greyhound hunting. Winters need to be cold in order to run greyhounds for coyotes. Wildlife Services took 230 coyotes off 100 sections over the study. National Grassland study area was composed of 36 sections of blue grama/buffalograss. So even in "good" habitat swift fox were not doing well until coyotes were controlled. Coyotes are a problem even in quality shortgrass prairie habitat. Coyotes historically could have been maintained at 50% of what they are now by wolves. Today we need humans to keep the pressure on coyote populations.

#### Wyoming

Bob Oakleaf - state is continuing along the same path. Coop Unit research determined that track plates were the best method for conducting population surveys in Wyoming. They have 60 locations for transects established for long-term monitoring. Monitoring will be initiated next year.

#### Canada

Lu Carbyn - Canada has tripled its swift fox population in the last three or four years, and the range is expanding. The question remains, why did they disappear in the first place.

They are re-colonizing very well and using vacant habitat. Swift fox were also common in this area historically. The main mortality factor is coyotes. The reintroduction effort released over 1000 foxes over 16 years. One fox has been documented to live eight years. Landowners support the project.

2000/2001 population assessment by Axel Moehrensclager is currently underway. As of December 20, in Alberta, 23 individual foxes were trapped in 11 townships; in Saskatchewan Border Area, 34 foxes were caught on 19 townships; in Grasslands Park, 12 foxes were caught in 23 townships; and in Montana, 18 townships yielded 12 foxes. Even more significant are comparisons between 1996/97 captures and what has been captured already in 2000. On the Canadian side, 63 foxes have been caught in 2000 on townships that yielded only 22 foxes in 96/97. Of 39 townships replicated so far, 12 had captures during both time periods whereas 15 had captures in neither time frame. Only three that had previous captures before have none now, while nine do have fox captures now after not having had any trapping success previously.

#### U.S. Forest Service National Grasslands

Bob Hodorff - Has not yet contacted the other grasslands to find out if any swift fox work was done in the 2000 field season but will get this done for the yearly report. The Fall River District of the Buffalo Gap National Grasslands has surveyed the Ardmore area and the swift fox are hanging in there. The Forest Service is currently writing a management plan for the National Grasslands in Wyoming, South Dakota, North Dakota, and Nebraska. Included in the plan is the establishment of a 'Special plant and wildlife habitat area for swift fox' in the Ardmore area. The Buffalo Gap is working on a land exchange that will pick up some land in the Ardmore swift fox area. Dan Uresk hopefully will have some data from the Ardmore area published next year.

#### U.S. National Park Service

Dan Licht - the National Park Service does not have good data on swift fox presence on NPS lands. With the exception of Badlands NP, there are few parks with swift fox potential. The recently authorized Sand Creek Massacre site in eastern Colorado will be about 10,000 acres and may also have potential for swift fox. The NPS is beginning a long-term inventory and monitoring initiative that may collect data on swift fox and other carnivores (still in the design phase in the Great Plains). The NPS is aware that the rangewide priorities for swift fox vary. The agency may be able to get funding for swift fox research and management, but funds must be spent on NPS property.

Badlands NP, Greg Schroeder - 244,000 acres with part of the habitat suitable for swift fox. The park adjoins Buffalo Gap NG. The park has bison, ferrets, and other native grassland species, so they want to bring swift fox into the system. The park is very excited about doing swift fox work. They are also working with Turner Endangered Species Fund since their Bad River Ranch site is about 1 hour away. In addition, the Ardmore swift fox population is about 40 miles away on the Nebraska/Wyoming border.

One or two swift fox sightings are made every year or so in the Badlands region; however, the veracity of the reports is questionable. The park has an intensive monitoring effort for black-footed ferrets; they have not detected any swift fox.

#### U.S. APHIS Wildlife Services

Steve Fairaizl - new representative for Wildlife Services and is still getting acquainted with Team. Nothing to report at this time.

#### U.S. Bureau Land Management

Eric Lawton - BLM is working with the state in Montana, New Mexico and Wyoming on swift fox inventories and surveys. BLM has a multi-species initiative for prairie grasslands. This is a new program that just got funded. BLM is now in the information gathering phase, and has held two prairie grasslands conservation strategy workshops with Bureau biologists. Looking at 2003 for completion. There are four BLM state offices with grassland BLM land - Montana (North and South Dakota BLM land are administered by the Montana State Office), Wyoming, Colorado, and New Mexico.

#### **SOP for Collecting, Handling and Storage of Blood**

A Proposal was made to store all blood and tissue samples at one location. Jerry Drago said that the Museum of Southwestern Biology (Museum) would be happy to store blood and tissue samples. The Team needs to formalize arrangements with Museum - Christiane and Jerry will work on this item. Whoever deposits a sample with the Museum would have say on where it goes. Anyone wishing to borrow sample would need permission from whoever deposited the sample. The Museum would just be a warehouse. A protocol would need to be established before any new blood work would be conducted. DNA work would have to be funded separately. There is a need to consolidate the samples that currently exist.

Regarding DNA work, there was a question of whether different labs use different procedures, or is the methodology standardized? Jerry responded that for mitochondrial DNA, it is pretty straightforward. For microsatellite DNA, different labs could be using different primers which makes results not comparable among labs. Developing the primers is expensive. The cheapest way to proceed is to find out what has been done already. There is no standard for making conclusions. So far, have not looked at difference in microsatellite DNA between swift and kit fox. Bob Wayne has looked at microsatellite in San Joaquin kit fox. The technique is the same for looking at microsatellite, but the primers are different. Having samples from a variety of states stored at the same place increases the chance for funding to look for primers. Each primer identifies a locus. Each locus has two alleles. The greater the number of alleles found in a population at the 1 locus, the greater the genetic diversity in the population.

Taxonomic work - Jerry Drago is not finding any real differences in mitochondrial DNA work on swift fox and kit fox in the Trans Pecos area of New Mexico. Twenty-two primers have been

color-dyed labeled. He is currently doing final analysis on 16, and 8 for the scat study.

## **BREAK**

### **Blackfeet/Defenders of Wildlife Reintroduction Program - Minette Johnson**

Defenders of Wildlife and the Blackfeet Tribe have spent the last three years restoring the swift fox on the Blackfeet Indian Reservation in northwestern Montana. The swift fox was considered extirpated from Montana in 1969 after being absent from trapping records for several decades. The swift fox used to be common in this area historically; 43 specimens were taken between 1900 - 1910. This program evolved out of the conclusion of the Canadian reintroduction program. Captive foxes were now available from the Cochrane Ecological Institute (CEI). So Defenders developed a partnership with CEI and the Blackfeet. A thorough evaluation of the habitat and prey base was done before putting foxes on a 20,000 acre tribal ranch within the middle of the Blackfeet Reservation. Cattle have been run on the ranch in the past, but cattle are now off the ranch. The area is now nice rolling prairie with large ground squirrel colonies, which will be the primary prey base for the swift fox. Ira Newbreast, with the Blackfeet Fish and Wildlife Department, was instrumental in making this project happen. The project was pulled together in a matter of months with limited funds.

In the summer of 1998, 30 captive foxes (13 females and 17 males - all juveniles) from CEI were released on the tribal ranch. We followed the release protocol provided by the Canadians. Portable protective shelters were set up over large burrows that had been established near the prey base. All permits were secured and vet checks and vaccinations were conducted before transporting the swift foxes. Eight release sites were used. Swift foxes were held in kennels with food and water at the shelters overnight, and then let go the next morning. The primary purpose of the shelters was to provide protection from predators during the vulnerable time right after the release. The eight groups released were family groups. Swift foxes were monitored intensively for 10 days by volunteers following release. Monitoring was then conducted weekly after that. No radio-collars were placed on the released swift foxes because the Blackfeet wanted a low profile release. Two swift foxes had confirmed mortality as a result of road-kill.

In 1999, the releases continued. Fifteen captive-raised swift foxes from CEI were released. Unfortunately, it was not as good a breeding year for the captive population. So only six adult pairs and three juvenile swift foxes were released in 1999. Of those, eight were radio-collared thanks to the kind donation of the radio-collars and tracking equipment from Montana Fish, Wildlife and Parks. Two mortalities were confirmed as natural predation. After the following spring, the remaining six radio-collared swift foxes were still alive.

In 2000, another 31 swift foxes were released - 20 females and 11 males, all juveniles. Sixteen were radio-collared. We secured additional funding so we could radio-collar more swift foxes. Of the 16 radio-collared, there were 3 mortalities which are waiting to for necropsy at this time.

So in total, 76 swift foxes (40 females and 36 males) have been released. Twenty swift foxes were radio collared, and eight have been located regularly (3 females and 5 males; 5 from the 2000 release and 3 from the 1999 release). Reproduction has been documented every year. In spring 1999, four dens with at least 20 pups were observed. In 2000, five dens with at least 21 pups were observed. This year it looks like there are at least nine active dens. Two tribal members have been hired to monitor the swift foxes every other day. They are doing an excellent job keeping track of the animals. Once spring comes, we'll fly to try and get a better idea of some of the dispersers. We have documented dispersal distances up to 12 miles. Some swift foxes could be much farther away than where we are currently looking for them.

Every summer tribal biologists have been keeping track of the swift foxes. A magazine article was written on the program. A brochure has also been developed which is being distributed throughout the Blackfeet Reservation to get the tribal members more involved in the whole process, especially in reporting sightings. We are looking at other reservations, in particular Fort Belknap and Northern Cheyenne for potential swift fox releases. Preliminary assessments of the sites have been completed.

The Blackfeet release so far has been a tremendous success. And we are continuing to put swift foxes on the ground. Releases are planned for at least another two years, followed by an evaluation. Given the survivorship and reproduction achieved, we expect the reintroduction to remain successful. Defenders is committed to re-establishing a self-sustaining viable population on the Blackfeet Reservation in Montana. We are currently working with the Turner Endangered Species Fund to raise funds to beef up the monitoring and documentation. We have produced reports every year documenting the protocol used.

Question - Are there any prairie dogs on the reservation? Answer: There are no prairie dogs in the area since it is outside of black-tailed prairie dog's historic range.

Question: Was there any coyote control prior or during releases? Answer: There was no organized coyote control. There are coyotes in the area. There are also wolves on reservation, but not at the swift fox reintroduction site yet.

Question: Has there been a severe winter? Answer: We haven't had a bad winter yet, although two years ago it was pretty cold. The worst winter so far has been the winter following the first release. The two road-killed swift foxes - one from November and one from December - were in excellent physical condition.

Question: How long are the shelters used? Answer: Portable shelters are used for only the first couple weeks following the release.

Question: Is the area currently grazed? Answer: Where swift fox are now on the Blackfeet, the area is not currently grazed by cattle.

Comment: There needs to be a documented protocol in place for monitoring reintroduction so it can be replicated elsewhere. It's not enough to put swift foxes out on the ground and monitor them. You need to do detailed research right from the beginning, and then adjust your protocol as you go along.

#### Coyote control discussion

In the Canadian release program, we didn't have to visit the coyote control issue. Many of the private landowners in the area were already conducting coyote control. One rancher killed over 120 coyotes. If coyote control is conducted there needs to be follow up monitoring to determine its effectiveness. Study it. Don't do it just to see what happens in a haphazard way.

To make coyote control effective, you would really have to hammer the population so hard and for so long to really affect a change in the coyote population. Otherwise they just bounce right back. So it may be helpful for a reintroduction project, even if you do prior to reintroduction, at some point the reintroduced swift foxes will need to be able to survive with coyotes. Long-term coyote control would have to be done at a local level. Even control over a three-year period, coyotes numbers return to pre-control levels quickly. If only doing control for a couple of months, they bounce back even faster. It's like removing water from the ocean with a teaspoon.

On the Badlands NP, there is a 30 day post-release predator control for ferrets. This gives the ferrets time to learn the new habitat and therefore, is helpful. Thus, it may be beneficial over the long-term even though coyote numbers have returned to pre-control levels. There is a concern of removing coyotes and then having new coyotes move into a release site and bring in disease - e.g. canine distemper. For ferrets, removing the predators was more beneficial than having distemper move back in with new predators. Reintroducing swift fox on the Badlands could bring in plague or distemper that could hurt the ferrets. But ferrets are going to have to live with these diseases, so the sooner they are exposed, the sooner we can learn the affects of that, the better we can manage the ferrets. Diseases shouldn't be a concern if swift foxes are certified disease-free prior to release.

You need to know where coyote core areas are before releasing swift fox in an area. Is coyote control a must for swift fox reintroduction in the northern plains? Canada didn't have to. But private ranchers did it - so it worked out well. Coyote control will never be long-term effective except on a local basis where it is conducted continuously. It could be beneficial at the start of a swift fox reintroduction program. New coyotes moving into the area following control, however, could bring in diseases.

## **Turner Properties Swift Fox Reintroduction Program - Kyran Kunkel**

At last year's Swift Fox Conservation Team meeting the Turner Endangered Species Fund (TESF) presented their proposal to reintroduce swift fox to the Bad River Ranch (BRR) in west-central South Dakota. The feasibility study plan was distributed last year. Now one year later, the feasibility study field work has been completed and suitability of the habitat has been evaluated. In conjunction with the feasibility study, the final draft of the reintroduction plan, describing how swift fox will be reintroduced to the BRR, was distributed.

Turner's goal is to return properties purchased to a more pristine state. Swift fox is just one component of the BRR property. The BRR property is 150,000 acres in west-central South Dakota. Ten thousand acres were cultivated cropland and are being restored to native grass. TESF is actively expanding black-tailed prairie dogs on the ranch. TESF has a 10-year prairie dog management plan for all Turner properties with a goal of 1,000,000 prairie dogs on Turner properties. So 10% of the BRR is targeted for black-tailed prairie dog occupation. The objective on the BRR related to swift fox is to establish a self-sustaining population and to aid in the recovery and expansion of the species in South Dakota and beyond. Potential partners include the Fort Pierre National Grassland, the Badlands National Park, the Cheyenne River Sioux Tribe, and the Lower Brule Sioux Tribe.

A habitat and population viability analysis of swift fox subpopulations was conducted. Took data from various studies and modeled for BRR. Result was the need to maintain adult mortality rates no greater than 35% on the BRR in order to have a sustaining population. Adult survival rate is the key to success of the reintroduction.

To assess reintroduction of swift fox to BRR, the TESF is following the guidelines that the International Union for the Conservation of Nature has developed for reintroductions. Most South Dakota residents favor native prairie and the species that go along with native prairie. So far on the BRR, bison have been reintroduced and currently have 2500 to 3000 bison with a goal of 7000 to 8000 bison. Based on modeling and literature review, the BRR could support between 90 -100 swift foxes. Adding the Fort Pierre NG would increase another 70 swift foxes. Add in the Lower Brule, increases another 110 - 170 swift foxes. Using just those three areas, a minimum swift fox population for maintaining genetic diversity could be established.

Last year's field work focused on looking at the suitability of the habitat and prey base availability. Prey base is critical to the swift fox's survival since it is a carnivore. Several surveys for both prey and other predators were conducted, with specific interest in coyote abundance. A GIS habitat suitability assessment of about 10,000 mi<sup>2</sup> for swift fox, was conducted based on soils, slope, land cover, and water. A suitability model was

developed that is very similar to the black-tailed prairie dog habitat suitability model. Based on this analysis, 85% of area is comprised of suitable swift fox habitat. On the BRR proper, 90% of the area is suitable. An escape terrain survey found that hole density is about 10 times higher than what has been recommended for swift and kit fox. Spotlight surveys for rabbits observed 0.6 jackrabbits and 0.1 cottontail rabbits per km<sup>2</sup>. Small mammal trapping grids yielded 33 small mammals per hectare during the fall. Insect surveys found 0.3 grasshoppers/m<sup>2</sup>. There are 350 ha of black-tailed prairie dogs. Grassland bird density information came from the Fort Pierre NG and was 1.68 male grassland birds/ha during the summer. Coyote density was found to be 0.47-0.56/km<sup>2</sup> and red fox density 0.04 to 0.06/km<sup>2</sup>.

So based on all these data, they extrapolated what the project area could support in swift fox. On jackrabbit density alone, the area could support 0.1 - 0.25 swift foxes per km<sup>2</sup> with a reproductive rate of about 5. Adding in other small mammals and prey, expect somewhat higher minimum densities and reproductive rates. Based on the relatively high density of coyotes in the project area, coyote control at the onset of reintroduction is warranted.

Analysis of habitat, prey base, and predator density indicates that the BRR is suitable for reintroducing swift fox and suitable for supporting a viable population of swift foxes. Present estimates of prey base, however, indicate the area would support a relatively low density swift fox population of slow population growth. Further, present coyote density indicates that coyote control may be necessary to help swift foxes establish during reintroduction.

### **Team Committee Reports**

**Education and Public Affairs Committee** - Eileen Dowd Stukel (Chair), Bob Hodorff, Bob Sullivan, Richard Bischof, Minette Johnson. Need swift fox slides and photos for sharing among the Team. Last newsletter was put together by Eileen. Many team members shared the newsletter with landowners through their state black-tailed prairie dog working groups. Need to coordinate efforts with black-tailed prairie dog and lesser prairie chicken groups. Need to find out what Tarren accomplished through the Zoo Taxonomic Advisory Group. Kansas still has their shortgrass video available.

**Habitat Committee** - Julianne Hoagland (Chair), Bob Oakleaf, Bob Sullivan, Robert Harrison, Lu Carbyn. Need a better look at swift fox habitat. Look at lesser prairie chicken habitat publication as an example. Work with education committee to develop a habitat brochure for landowners. Need standardization of protocol for habitat evaluation from site to site, state by state, rangewide. Marsha has 7,100 swift fox point data gathered. Need to look at the habitat associated with these "points." Standardize the habitat to measure at these points - develop criteria. Need to work with NRCS on CRP. NRCS needs to have a member on the Team.

Already accomplished literature review in 1997 and has since been updated in 2000. Developed rangewide USGS land use and cover ArcView shape files for the swift fox historic range. ArcView shapefiles of county by county distribution data have been generated as well. Need to coordinate with the black-tailed prairie dog group so as not to duplicate effort, since the black-tailed prairie dog and swift fox have similar historic ranges. Need some updating on landuse and land cover data set.

Robert Harrison: Need some better ideas of what constitutes swift fox habitat. What's in the literature is not that helpful. Swift fox are very flexible so it's hard to pin down what is exactly good habitat for them and what is not. We know trees, lots and lots of shrubs, and canyons are not good, but beyond that it is hard to say. There just isn't good information out there. The committee needs to take a look at this because it keeps coming up.

Kyran: TESH built their swift fox model based upon the black-tailed prairie dog model. You could do this modeling approach throughout the swift fox's range in areas with swift fox and without swift fox. Then build a swift fox model.

Robert H: Can't do with swift foxes because you find swift foxes in areas of high slope and low slope - so what's the model?

Robert Sullivan: Can't do this from state agency perspective. Nice academic questions, but could reduce to answering one question about habitat where we know swift fox occur.

Lu: The problem is that habitat descriptions are very general with no data to back it up. Do we need a quantitative scientific product or qualitative product that is area specific? Can't do a good study design or have control of the study area on private lands.

Christiane: We can't look at a few study areas on protected or public lands and then extrapolate across the range where private land comprises the bulk of habitat. The swift fox range is such a huge area. There's already a lot of great information out there.

Robert Sullivan: There has to be a practical aspect to the research for the landowner. So you can apply the results of what we find out to landowners to improve their habitat for swift fox. Need general descriptions now that we can give to landowners in a brochure similar to what has been developed for lesser prairie chickens and black-tailed prairie dogs. Information for the brochure should include, percent tilled versus untilled, stocking rates, grass length, percent shrubs, percent native grass, type of topography. Landowners will not be gathering information. We already have the information that we need for landowners, but we don't have it in a slick brochure ready for distribution.

Badlands National Park would like to start a habitat assessment for swift fox. Would it be appropriate to use the Turner BRR model? Since not all Team members have seen the

results of the TESF feasibility study or reintroduction plan, first need to distribute the TESF documents and get feedback. Then could tweak the procedures for the Badlands once review and comments are complete.

Use an ecosystem approach to habitat management prescriptions for landowners and state what species would benefit from potential habitat improvements.

Lu: Need to carry out a continent-wide habitat study, with the objective to evaluate areas with swift foxes and compare a number of parameters with areas that do not have swift foxes. Particular emphasis should be placed on human activities at different sites that may influence swift fox survival. Such activities would range from coyote control to grazing regimes and habitat modification.

Lu volunteered to put habitat evaluation research guidelines together.

What scale do we want to focus on? Need habitat assessment guidelines for reintroduction efforts. Then need general habitat descriptions and management recommendations for landowners (particularly in the southern end of the range). Need research that's applied with management implications, again particularly for landowners. Need more information on competition and predation from other canids and how this relates to habitat availability/suitability, etc.

**Research Committee** - Marsha Sovada (Chair), Christiane, Lu Carbyn, Axel Moehrensclager. Christiane reported. Marsha sends her regrets that she could not attend this year's meeting. In the last year, the committee has been collecting and synthesizing all the point data available on swift fox. Marsha and Brain Scheick produced the preliminary historic and recent distribution of swift foxes in North America document, which is included in the 1999 annual report. Committee's original purpose was to coordinate research efforts and prepare proposals for funding, so valuable resources weren't wasted on research that wasn't a priority for the conservation strategy. Also the committee provides statistical and analysis support, and helps to identify and share research equipment. Right now committee hasn't any known sources of funding. A couple of DNA proposals submitted a couple of years ago still need funding. Marsha has added new literature sources to the swift fox bibliography maintained at Northern Prairie's website. Still working on analysis of track data from Kansas. There are some new publications everyone should be aware of. Two of the publications from the Kansas swift fox research came out this year. But, there are some problems with these publications.

Need to finalize the protocol in the SOP for collecting blood and tissue samples. This will be published in the 2000 annual report. Add road-kills to the SOP. Need to get a repository protocol from the Museum.

Committees need to come up with a list of tasks to complete within the next year, related back to Conservation Strategy.

### **Status of Swift Fox - USFWS**

Pete Gober: We achieved a significant milestone with removing the swift fox from the Candidate status. Thanks are in order to the Team, Chairs, and Marsha Sovada. We figured out a way to incorporate the information we had with the process we had to deal with pursuant to the Endangered Species Act (ESA). We saw the continuity of swift fox distribution issue come toward the front, and compared with issues we had to deal with, a significant portion of the range, the habitat requirements, it wasn't difficult to make the argument that the swift fox did not warrant listing under the ESA at this time. The information had to be in a certain form in order for this to happen and the Team summarized this well in the letter at the end. There was a window of opportunity in which the Service could do a Candidate Assessment rather than a revised 12-month finding, and they took that opportunity. The Team has done a great deal of work over the years gathering and providing information. There are some minor errors in the Candidate Assessment and in the summary that ended up in the Federal Register. Not significant. The Service will continue to work as a full member of the Team and with Pete as the Service's Team representative.

Petitioners and conservation groups are willing to wait and see how the Team operates and what the State agency commitments will be now that the swift fox is off the candidate list. The Service doesn't anticipate any legal challenges at this time. But the Service is prepared if there are challenges. The Service doesn't make a decision unless they can defend it. The swift fox was the only species that came off the Candidate list during this recent review. Of course we all know that we still have a species at risk with the swift fox. The Service encourages the Team to demonstrate that the states are doing good things for swift fox. The Service could always be petitioned again and the species could go back on candidate status in the future. Based on the information we have now, that is not likely, but things can change over time. Who knows where we'll be in the years to come and what will occur.

There are different pots of money out there now that could be applied to swift fox, such as the USGS Biological Resources Division Species at Risk money. The Team needs to be looking at ways to help folks like Marsha by obtaining funding. We need to have several proposals ready to go that we could pull off the shelf when these funding programs are taking proposals. Grants and Aid effort that's coming along for the states, have many proposals for species at risk that can be competitive for the \$50 million. Every state is probably going to get a share. Process will probably be run through Federal Aid with a grant proposal process similar to Section 6.

Now that the Swift Fox Conservation Team has made progress, it is time to overlap with

other individual species' groups (black-tailed prairie dog, lesser prairie chicken, etc.) and generate a shortgrass prairie group. Should we restructure the Swift Fox Conservation Team into an ecoregion Conservation Team? Great on theory but has not been too good in practice. The reality of the swift fox is that we found out more about the species, its distribution and habitat use. But we didn't make commitments toward management that made fundamental changes on the ground. The black-tailed prairie dog is going to require that. But we are optimistic that the success of the Swift Fox Team can lead to success for black-tailed prairie dog conservation. Process commitments are hard to do in a multi-species group.

The states of Wyoming, Colorado and Kansas could think about getting an state umbrella Candidate Conservation Agreement with Assurances for swift fox.

Need letters of support for continued management of swift fox from state and federal agencies. The Team Chair will solicit and collect letters and forward copies of letters to Service as well as publish letters in 2000 annual report. Need to know what protection is afforded the swift fox now that it is no longer a Federal Candidate.

There is a letter from Wildlife Services stating that throughout the swift fox range, coyote trap pan tension devices and settings will be used that reduce likelihood of capturing swift fox while conducting coyote control work. If any swift foxes are incidentally taken, can those animals be turned over for analysis say to the Wyoming facility? Beth Williams is addressing the swift fox disease issue, and evaluating trap injuries in an unrelated project. She could also then take samples for DNA work. Right now those specimens are lost. Need to take advantage of any carcasses we can get a hold of. Beth needs funding. Beth could take a sample and ship samples off to the Museum after doing her disease and injury evaluation. Samples need to end up in a curated collection.

What is missing from the SOP? Include carcass collection in SOP. Need proper documentation of permits to be attached to the samples to the Museum. We need to know what to do if someone brings in an incidental take animal how to process it, how much it's going to cost, and where the samples, etc. need to go. That's not all in the SOP as it stands right now. What permits are required. Museum has no charge for being repository.

#### **Conservation Strategy Action items scheduled for completion in 2002**

- 6.1.1. Each state wildlife agency will coordinate with the federal and state land management agencies to evaluate current levels of legal protection of native grasslands located within federal and state ownership.
- 6.1.2. Each state wildlife agency will initiate habitat protection agreements with other government agencies for public land as habitat needs are identified.
- 6.1.3. Each state is to identify and delineate habitat corridors and surrounding areas between

habitat blocks based on the spatial location of suitable habitat that is available to be managed for swift fox, in order to direct conservation measures, agreements or enhancement efforts.

- 6.2.1. State and federal wildlife agencies are to initiate land conservation or protection measures under current lands programs as limited by priorities and within funding ability, or are to consider creating a lands program with new or redirected funding sources. Agencies will investigate the feasibility of partnerships with the private sector. On identified critical private lands state agencies should utilize conservation easements or agreements, leases, donations, exchanges or acquisitions. An evaluation and prioritization process of private lands in areas identified to implement land conservation efforts will be initiated.
- 6.2.2. Implement methods and techniques to gain and maintain cooperation with private landowners that may (will) influence range management practices, through state extension agents, federal grazing leases, and NRCS range specialists. Efforts will be directed primarily at occupied habitat and secondarily at available suitable habitat.
- 7.2.1. Create a technical committee to review available scientific literature on interspecific competition and applicable control methods. The committee will provide information and recommendations to state wildlife and federal land management agencies as guidelines.
- 7.2.2. The SFCT and state working groups will review and incorporate information from scientific investigations that address the adaptability of swift fox to colonize non-native habitats and which evaluate the species' ability to maintain itself in these habitats.
- 7.2.3. The SFCT and state working groups will identify and report new, continuing or diminishing threats to swift fox population expansion.
- 9.1.1. The SFCT and state working groups will collect and compile current technical literature and management information for distribution through information requests from state and federal managers and other interested individuals.
- 9.1.2. The SFCT and state working groups are to provide recommendations on standard management guidelines, beneficial range management practices for swift fox, methods for data collection/database management, and current information on swift fox ecology, management, and research to wildlife and land managers, government entities, land planners, state and federal policy makers.
- 9.1.3. The SFCT will consider cooperating on a joint publication that promotes the scientific basis for conserving prairie species, including swift fox, for distribution to wildlife and land managers. If it is determined that this document is needed and jointly supported, funding will be solicited from cooperators and partners.

#### **Swift fox book update.**

Lu: passed out the Table of Contents for the book Ecology and Management of Swift Foxes in a Changing World. Five parts to the book: Setting the Stage, Distribution and Population Shifts, Censusing and Techniques, Population Ecology, and Taxonomy/Physiology/Disease. Still need good photographs, particularly of habitat. Slides or prints will work for photographs. Have a publisher lined up and Smithsonian is very interested

in being a co-publisher. Still waiting on one of the most important papers, the taxonomy paper.

### **Funding Issues for Swift Fox**

Need to have some pre-proposals ready to go so when we discover opportunities for funding under different pots of money we have proposals ready to go. The National Fish and Wildlife Foundation (NFWF) is a good opportunity for matching state dollars being spent on swift fox. NFWF is interested in new projects. Office head in Denver is Don Glasier. Pete will set up meeting with NFWF for March 8. BLM has \$3,000,000 NFWF competitive annual grant program. Similar to NRCS program. Need to identify players and the dollars and matches available. Shop the match from the level of state dollar commitment already being expended and planned for swift fox conservation at the state level. Eileen and Julianne volunteered to work on a **Funding Committee** and will work with Marsha to put some pre-proposals together. Committee will also put together a Swift Fox Team success story 15-minute presentation that will be ready to go and use to make pitches to different contacts for funding initiatives. There is an April 2, deadline for NFWF pre-proposals under NRCS competitive grants. Eric Lawton will send out NFWF BLM handbook. Looking for multiple year, multi-state and/or multi-discipline, small dollar proposals per year.

### **Administrative Details for 2000**

Team Chair - Richard Bischof, Nebraska with Greg Schmitt, New Mexico, as co-chair.

2000 Annual Report - Greg Schmitt volunteered to edit the 2000 Annual Report and Bob Oakleaf will serve as co-editor. Include landowner brochure information. The annual report information will be due to Greg in April. Greg needs both a e-copy on a floppy in a word processor and hard copy both. Greg will set the format and everyone try to use same format. Letters supporting swift fox management and protection need to be in the Administrative Record. Team will include these letters in the annual report. By submitting the annual report to Service they should effectively be in the administrative record. Please provide a description of conservation considerations under practice as relates to swift fox. Letters could also be posted on the USFWS website. Need more 1999 annual reports printed up and sent to Minette and Kyran.

Annual Coordination Meeting 2001 - Eileen offered South Dakota to host the 2001 annual meeting. Week of October 15, 2001. Have 2 days - 1 day meeting and 1 day field trip. Committees will meet the evening before the general meeting. Discussed joint meeting with black-tailed prairie dog group. The black-tailed prairie dog group is not ready yet for joint meeting. Flyway meetings could be a template for how to do shortgrass group in the future. But Flyway meetings have strong agency and financial support. Something lacking right now for a grassland group. Maybe have a black-footed ferret reintroduction site field trip. Maybe join an Ardmore field trip on too. Bring annual agency reports for 2001 to the meeting in October, 2001.

The meeting was adjourned at 11:55 am.



**Montana Fish,  
Wildlife & Parks**

P. O. Box 200701  
Helena, MT 59620-0701  
(406) 444-3186  
FAX:406-444-4952  
Ref:DO0161-01  
April 4, 2001

Richard Bischof  
Swift Fox Conservation Team, Chair  
Nebraska Game and Parks Commission  
Wildlife Division  
2200 N. 33<sup>rd</sup> Street  
Lincoln, NE 68503-0370

Dear Mr. Bischof:

The intent of this correspondence is to address your request regarding our participation with the Swift Fox Conservation Team (SFCT) and Fish, Wildlife & Parks' (FWP) involvement with swift fox management activities in Montana. FWP continues to support the efforts of the SFCT on both national and state levels through our endorsement of the swift fox conservation strategy document produced by the SFCT in 1997. FWP will maintain representation on the SFCT to demonstrate our support for implementing this species conservation plan through the target completion date of 2015.

FWP's management and research activities initiated since 1995, as described in the SFCT annual reports, indicate past commitment toward swift fox conservation. During the next two years, FWP is collaborating with the Bureau of Land Management (BLM) and Canadian wildlife officials on completing an international swift fox census. Results will address population size and trend, species distribution, habitat assessments, and population viability of this Canada-Montana population. In addition, FWP is initiating a cost-share project with the BLM to determine statewide species distribution that will be conducted in the fall of 2001 and 2002.

To document changing distribution and species status in Montana, FWP intend's to follow the population monitoring criteria as outlined in the swift fox conservation strategy. FWP expects to conduct periodic monitoring activities around a five-year interval schedule. Long-term monitoring of Montana's classified furbearer species, including swift fox, is a priority in the wildlife program to help FWP assess species conservation needs, habitat protection, management and research activities, and harvest strategies.

Sincerely,

17 M. Jeff Hagener  
Director

# WYOMING GAME AND FISH DEPARTMENT

Jim Geringer, Governor



John Baughman, Director

*"Conserving Wildlife — Serving People"*

March 20, 2001

Richard Bischof, Chair  
Swift Fox Conservation Team  
2200 N. 33<sup>rd</sup> Street  
Lincoln, NE 68503-0370

Dear Mr. Bischof:

The Wyoming Game and Fish Department remains committed to the conservation of swift fox. The Department has been active in the past in this effort. We have provided live-caught animals to Canada for its reintroduction efforts, participated in development and implementation of the interstate conservation strategy, and funded research on the species to determine both its distribution in the state and important life history information. We have also promoted prairie ecosystem management and conservation. The Department intends to continue these efforts in the future.

Wyoming will remain a member of the interstate Swift Fox Conservation Team and support its activities to the extent possible given our financial and personnel resources. The Department will conduct annual surveys to document swift fox distribution and trends in abundance in its annual work tasks. These annual scent/track plate surveys will continue our efforts to monitor presence and status of the species in the state. The Department will also continue soliciting trapper swift fox sightings and trapping occurrences as part of our furbearer trapping survey. We initiated this effort several years ago and have integrated it into our annual survey protocol. The Department intends to continue its efforts to conserve prairie habitats and work with other agencies and with private landowners to capitalize on programs directed at prairie habitat restoration and improvement. Department involvement in efforts to conserve other prairie species, such as the black-tailed prairie dog and black-footed ferret, will also benefit the swift fox. We also intend to continue our information and education efforts to inform our publics about prairie ecosystem conservation and the importance of conservation efforts, including those that specifically benefit swift fox. As part of our institutionalized system to review and comment on project proposals that might affect wildlife, we will continue to recommend that actions in prairie habitats minimize the impacts to swift fox and other species.

Richard Bischof, Chair  
March 20, 2001  
Page 2

We have been asked by the Turner Endangered Species Fund to cooperate with it, Indian tribes and other agencies on swift fox reintroductions in South Dakota. The Department is currently reviewing the draft MOU for this effort and will likely contribute swift foxes from Wyoming to this effort, as well as provide other technical assistance.

Sincerely

A handwritten signature in black ink, appearing to read "John Baughman", with a long horizontal flourish extending to the right.

John Baughman  
Director

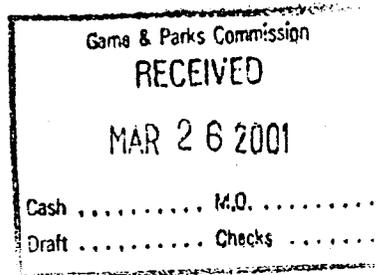
JB/RR/cmc

cc: Wildlife Division  
R. Rothwell  
B. Oakleaf  
File

STATE OF COLORADO  
Bill Owens, Governor  
DEPARTMENT OF NATURAL RESOURCES  
**DIVISION OF WILDLIFE**

AN EQUAL OPPORTUNITY EMPLOYER

Russell George, Director  
6060 Broadway  
Denver, Colorado 80216  
Telephone: (303) 297-1192



*For Wildlife-  
For People*

22 March 2001

Richard Bischoff  
Chair, Swift Fox Conservation Team  
Nebraska Game and Parks Commission  
Wildlife Division  
2200 N. 33<sup>rd</sup> Street  
Lincoln, NE 68503-0370

Dear Mr. Bischoff:

Thank you for your letter 12 March 2001 requesting information on the commitment and support that the Colorado Division of Wildlife expects to give to ongoing efforts to conserve the swift fox (*Vulpes velox*). You asked for information on 4 specific points, which are addressed in order below.

**1. Brief description of swift projects scheduled for the near future**

We have budgeted for a swift fox inventory for our 2002-2003 fiscal year, beginning in July of 2002. This will be an update of the inventory that we conducted from 1995 through 1997. We also expect that Colorado swift fox populations will serve as a source for reintroductions into unoccupied habitat in other states and are prepared to assist with those efforts.

While we have no other specific swift projects scheduled, we anticipate completing a swift fox inventory at least every 3 years.

**2. Brief description of long-term monitoring plans**

Monitoring will take place formally through the inventory described above. We will also be conducting species presence/absence surveys in relation to our prairie dog incentive program which will note the presence of swift fox.

**3. Statement of continuing participation in Swift Fox Conservation Team**

We are committed to continuing participation in the Swift Fox Conservation Team. As you know, we have created a Species Conservation Section which is dedicated to coordination of efforts to conserve threatened, endangered, and special concern species. One of the positions in that section is devoted to grassland species, and swift fox issues will continue to be an important part of that position's duties.

4. **Acknowledgment of need for continued management and monitoring of swift fox**

We agree that the swift fox must continue to be managed and monitored in order to ensure its continued healthy status. It is our belief that one of the best ways to accomplish the conservation of the swift fox, along with other shortgrass prairie species such as the black-tailed prairie dog, burrowing owl, mountain plover, ferruginous hawk, and others, is through a comprehensive grasslands management program. We anticipate that such a program can be developed through cooperation with state and federal agencies, and expect the federal farm bill to play an important role in such a program.

Thank you for your continued work on swift fox conservation. The Colorado Division of Wildlife expects to continue to support all of the necessary conservation actions that will ensure healthy populations of the swift fox.

Sincerely,

A handwritten signature in cursive script that reads "Russell George". The signature is written in black ink and is positioned below the word "Sincerely,".

Russell George, Director

cc: Tom Blickensderfer  
Walt Graul  
Gary Skiba

GOVERNOR  
Gary E. Johnson



DIRECTOR AND SECRETARY  
TO THE COMMISSION  
Larry G. Bell

STATE OF NEW MEXICO  
**DEPARTMENT OF GAME & FISH**

P.O. Box 25112  
Santa Fe, NM 87504

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Ray Westall  
Loco Hills, NM

26 July 2001

Mr. Richard Bischof  
Swift Fox Conservation Team Chair  
Nebraska Game and Parks Commission  
Wildlife Division  
220 N. 33rd St.  
Lincoln, Nebraska 68503-0370

Dear Mr. Bischof:

Thank you for your 1 March 2001 letter concerning commitments of the New Mexico Department of Game and Fish (Department) on conservation of the swift fox (*Vulpes velox*). As requested, below is a brief description of the Department's planned efforts on behalf of the swift fox:

**1. A brief description of swift fox projects scheduled for the near future.**

At the end this year, the Department will be completing a three year investigation that has been focused on the ecology of swift foxes in New Mexico. These investigations have provided new information on population viability, natality, mortality, density, diet, den site selection, and data from which estimates of their home range can be made.

**2. A brief description of long term monitoring plans.**

During 2002, we will continue to evaluate a method of estimating density of swift foxes by identification of scats (by DNA) of individual foxes. We are optimistic that this method will be an efficient and effective method to monitor populations of swift foxes throughout New Mexico.

**3. A statement of continuing participation in Swift Fox Conservation Team efforts and support thereof.**

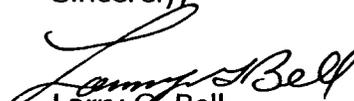
Personnel from the Department will continue to be active participants in the Swift Fox Conservation Team and continue to support efforts of this successful conservation effort.

**4. An acknowledgment of the need for continued monitoring and management of the swift fox with the goal of the species' conservation.**

The Department is committed to continued monitoring and management of the swift fox in New Mexico as a protected furbearer and will continue support for range-wide conservation efforts on behalf of this species.

We recognize that removal of the swift fox from the list of candidate species for listing under the Endangered Species Act was in part a result of collective efforts by members of the Swift Fox Conservation Team. We also understand that additional work remains to be done in New Mexico and we plan to continue these efforts.

Sincerely,

  
Larry G. Bell  
Director

LB/cgs

cc: Tod Stevenson  
Chuck Hayes  
Reagen Smetak  
Rich Beausoleil  
C. Gregory Schmitt

*South Dakota*

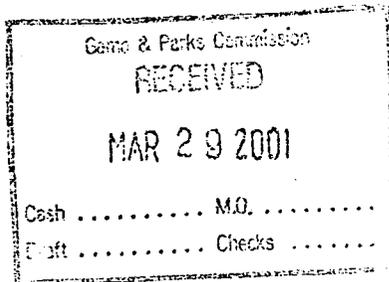


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March 26, 2001

**DEPARTMENT OF GAME, FISH AND PARKS**

Foss Building  
523 East Capitol  
Pierre, South Dakota 57501-3182



Richard Bischof  
Chair, Swift Fox Conservation Team  
Nebraska Game and Parks Commission  
2200 N. 33<sup>rd</sup> Street  
Lincoln, NE 68503-0370

Dear Richard:

I am responding to your letter of March 1, in which you requested a description of our agency's future commitment to swift fox conservation activities. Since the swift fox is a state threatened species in South Dakota, our involvement will continue regardless of the federal listing status.

As staffing allows, we will continue our participation with the Swift Fox Conservation Team. For example, we plan to cohost the 2001 annual meeting of the Team in Rapid City, South Dakota. Our immediate project plans include a cooperative study with South Dakota State University to examine swift fox den sites in southwestern South Dakota with the use of motion-activated video cameras. Our long-term monitoring plans will involve a partnership with the Fall River Ranger District of Nebraska National Forest to best determine and address factors that might be limiting expansion of the Ardmore swift fox population. We are in the process of providing input and possible field assistance with swift fox reintroduction on Ted Turner's Bad River Ranch in South Dakota.

I fully agree with your characterization of the Swift Fox Conservation Team as a success story in rare species conservation and cooperation. We support the continued focus on sound science in population monitoring and in fulfilling the conservation direction provided for in the "Conservation Assessment and Conservation Strategy for Swift Fox in the United States."

Sincerely,

*Doug Hansen*

Doug Hansen  
Division Director



# Nebraska Game and Parks Commission

2200 N. 33rd St. / P.O. Box 30370 / Lincoln, NE 68503-0370

Phone: 402-471-0641 / Fax: 402-471-5528 / <http://www.ngpc.state.ne.us/>

March 30, 2001

Richard Bischof, Chair  
Swift Fox Conservation Team  
2200 North 33<sup>rd</sup> St.  
Lincoln, NE 68503-0370

Dear Mr. Bischof;

Thank you for your update on the Swift Fox Conservation Team's activities. The Nebraska Game and Parks Commission is committed to support the Team's efforts to ensure the long-term survival of the swift fox. Please find below, addressed individually, each item requested.

**1. A brief description of swift fox projects scheduled for the near future.**

A swift fox scent station survey is will be conducted during April and May 2001. This survey is going to take place in the Nebraska panhandle and focus on areas with previous swift fox observations and/or appropriate habitat. The objectives of this survey are the gathering of distribution information on swift fox in Nebraska and the generation of baseline data for long-term monitoring.

**2. A brief description of long term monitoring plans.**

We will initially implement annual surveys for the next 5 years. These surveys will be focused at estimating distribution and establishing population trend measures. We are currently in the beginning stages of a budgetary process for the next 5 years. Incorporating information from the outcome of these surveys, a long-term monitoring program will be designed and implemented.

**3. A statement of continuing participation in Swift Fox Conservation Team efforts and support thereof.**

We will continue to participate in the Swift Fox Conservation Team and support the Teams efforts.

**4. An acknowledgment of the need for continued monitoring and management of the swift fox with the goal of the species' conservation.**

We are aware that the Swift Fox remains a species in need of conservation. As such, we agree that continued monitoring and management of the swift fox and its ecosystem throughout its range is required to ensure the long-term survival of the species. 25

The Nebraska Game and Parks Commission will remain represented in the Swift Fox Conservation Team and commits to assist the Team with its monitoring and management activities directed at the swift fox' conservation.

Sincerely,

A handwritten signature in black ink that reads "Rex Amack". The signature is written in a cursive style with a long horizontal line extending from the end of the name.

Rex Amack  
Director

Cc.: Wildlife Division: Jim Douglas, Mace Hack

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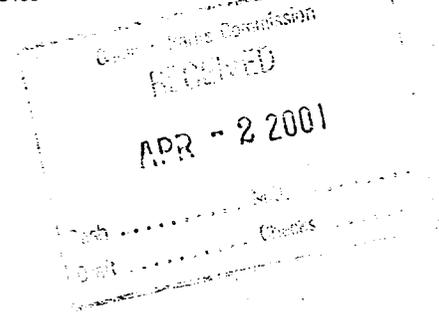
DEPARTMENT OF WILDLIFE CONSERVATION

1801 N. LINCOLN

P.O. BOX 53465

OKLAHOMA CITY, OK 73105

PH. 521-3851



March 26, 2001

Mr. Richard Bischof  
Nebraska Game and Parks Commission  
2200 N 33<sup>rd</sup> St.  
Lincoln, NE 68503-0370

Dear Mr Bischof:

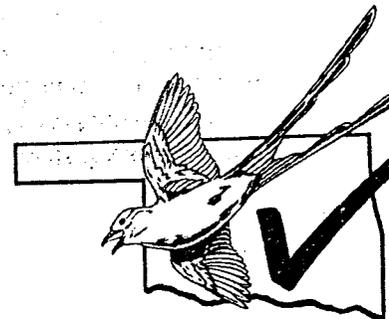
This letter is in response to your request, on behalf of the Swift Fox Conservation Team (Team), for the Oklahoma Department of Wildlife Conservation's (ODWC) commitment to and degree of support for swift fox management. Although we agree with the U.S. Fish and Wildlife Service's decision to remove the swift fox from the Federal Candidate list, we continue to classify the swift fox as a state species of special concern. As such, the ODWC intends to move forward in our effort to appropriately manage the species within our state. Our goal continues to be the conservation of swift fox both in Oklahoma and throughout its historic range.

A three-year swift fox distribution study was completed in 2000, indicating that swift fox still occur throughout the shortgrass High Plains region of Oklahoma. This study involved a systematic track survey in the panhandle and northwest counties of the state. With the distribution study completed, we will begin long-term monitoring of this region. We are working with the Northern Prairie Wildlife Research Center in an effort to determine the most suitable technique for long-term monitoring of swift fox populations in this portion of the range. At this time, we propose to initiate long-term monitoring of every third township every three years, beginning in 2003. For 2001, we have additional Section 6 funding to look at swift fox habitat preferences in the shortgrass High Plains.

The ODWC has been an active member of the Team since its inception in 1994. Our swift fox management program has been, and will continue to be, coordinated through the Conservation Strategy developed by the Team in 1997. Working through the Team's conservation strategy framework is the best way to enhance conservation for this species both locally and rangewide. We are focusing our swift fox management efforts on existing populations and determining the amount of available suitable habitat for population expansion and growth. The ODWC will continue working with the Team in our commitment to ensuring the conservation of this unique species.

Sincerely,

Greg D. Duffy  
Director





May 31, 2001

Mr. Richard Bischof
Swift Fox Conservation Team, Chair
Nebraska Game and Parks Commission
Wildlife Division
2200 N. 33rd St.
Lincoln, NE 68503-0370

Handwritten notes and stamps, including 'JUN 4 2001' and 'P. 04'

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ANDREW SANSON
EXECUTIVE DIRECTOR

Dear Mr. Bischof:

First, I want to congratulate you and the members of the conservation team for the success of your efforts. We all owe the team a hearty "thanks" for challenging work well done. The success of this multi-state effort has established a model for interstate and interagency cooperation for resolving threatened and endangered species issues at a new scale and affirmed the model's credibility and efficacy.

Texas Parks and Wildlife is strongly committed to continuing to fulfill the goals established in the Swift Fox Interstate Conservation Strategy developed by the Swift Fox Conservation Team (SFCT). We are fully aware that without continued research, monitoring, and conservation efforts from all states across its historic range, the swift fox will likely be re-petitioned for listing in the future.

We are currently completing a three-year study on the "Effects of Coyotes on the Distribution, Productivity, and Survival of Swift Foxes in The Texas Panhandle" (\$43,000), and have provided new funding (\$17,000) to address additional conservation goals established by the SFCT, including information on den site ecology and estimates of minimum viable population size.

In Texas, the swift fox and its short-grass prairie habitat remain a special conservation priority eligible for funding under Section 6, Pittman/Robertson legislation, new Wildlife Conservation and Restoration Program (WCRP) funds, as well as partnered federal and state sponsored landowner incentive program funds. We will be aggressively pursuing and applying these funds to projects that will directly effect swift foxes. In addition, TPW personnel in partnership with researchers from Texas Tech University have submitted a swift fox research proposal to the National Fish and Wildlife Foundation. Also, we are engaged in a major environmental education program for the short-grass prairie region.

We look forward to continuing our relationship with the SFCT and to the achievement of its goals.

Sincerely,

Gary Graham
Director, Wildlife Division

GG:mdb

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# United States Department of the Interior



## FISH AND WILDLIFE SERVICE Mountain-Prairie Region

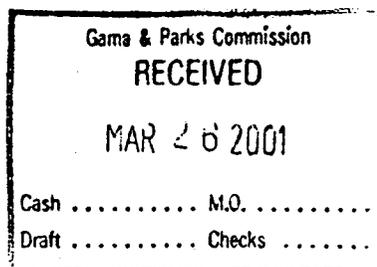
IN REPLY REFER TO:  
FWS/R6  
ES

MAILING ADDRESS:  
Post Office Box 25486  
Denver Federal Center  
Denver, Colorado 80225-0486

STREET LOCATION:  
134 Union Blvd.  
Lakewood, Colorado 80228-1807

MAR 21 2001

Mr. Richard Bischof  
Wildlife Program Manager  
Nebraska Game and Parks Commission  
2200 North 33<sup>rd</sup> Street  
Lincoln, Nebraska 68502



Dear Mr. Bischof:

Thank you for your recent update regarding activities of the Swift Fox Conservation Team. We agree that the efforts of the Team contributed considerably to the removal of the swift fox from the Federal Candidate List. The Fish and Wildlife Service will continue to follow and encourage the Team's efforts.

The Service is committed to continued participation in Swift Fox Conservation Team activities. We also support long-term monitoring and management plans throughout the range of the swift fox. We look forward to continued progress in the conservation of the species. If you have any questions regarding the Service's involvement in future Team activities, please contact Pete Gober, Field Supervisor, South Dakota Ecological Services at (605) 224-8693, extension 24.

Sincerely,

Acting Regional Director



# United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Washington, D.C. 20240

<http://www.blm.gov>

APR 25 2001

6500 (230)

Mr. Richard Bischof  
Chair  
Swift Fox Conservation Team  
Nebraska Game and Parks Commission  
2200 North 33rd Street  
Lincoln, Nebraska 68503-0370

Dear Mr. Bischof:

Thank you for your letter of March 12, 2001, regarding current activities of the Swift Fox Conservation Team. As you requested, below is a description of the Bureau of Land Management's (BLM) commitment in support of the Team's efforts to ensure the long-term survival of the swift fox.

**1. A brief description of swift fox projects scheduled for the near future.**

The BLM in Northern Montana is working in conjunction with the Canadian Wildlife Service and the Montana Department of Fish, Wildlife, and Parks, to document expanding swift fox populations along the U.S./Canadian border. Canadian protocol is being utilized for swift fox sampling in four northern Montana counties to trap and tattoo the animals and take biological samples (blood/DNA) to document distribution for known, probable and suspected occupied habitat. Plans call to expand this effort during the fall south into central Montana. Future efforts to document occurrence will be reduced to track transects as opposed to trapping.

Track plate surveys conducted in other BLM grassland states on potential swift fox habitat have yielded some positive results, and plans are being made to conduct future monitoring.

**2. A brief description of long term monitoring plans.**

The BLM manages approximately 10 million acres within the short and mid-grass prairie ecosystem. This region extends from Canada south to Texas, and from the eastern foothills of the Rocky Mountains to the tall-grass prairie in the midwest. Concern over the condition of prairie grasslands on public land significantly increased with the finding that the black-tailed prairie dog was warranted for listing as a threatened species but precluded by higher priorities, and the proposed listing of the mountain plover as threatened. The BLM is developing a multi-species conservation

strategy for the lands it administers throughout the region. The first phase concentrates on assembling pertinent information regarding various species at risk and developing longer-term strategies for addressing management issues on public lands. The BLM has not identified any long term plans for swift fox monitoring, however, it will be a component of the prairie grassland conservation strategy as it develops.

**3. A statement of continuing participation in Swift Fox Conservation Team efforts and support thereof.**

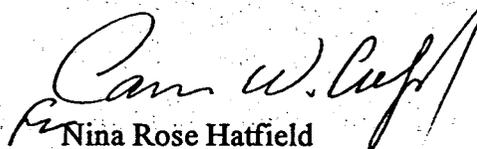
In an effort to ensure the long-term survival of the swift fox, BLM will continue to support and participate in Swift Fox Conservation Team activities.

**4. An acknowledgment of the need for continued monitoring and management of the swift fox with the goal of the species' conservation.**

The BLM is aware that the swift fox remains a species in need of conservation, and is ensuring that this is addressed in activities such as oil and gas development, rights-of-way, organized recreational events, etc. We are also cooperating with Federal and State wildlife agencies and non-governmental organizations in State-level conservation assessments and plan development. We agree that continued monitoring and management of the swift fox and the grassland ecosystem is required to ensure long-term survival of the species.

The BLM will continue its representation on the Swift Fox Conservation Team and assisting with its monitoring and management activities. If you need further assistance, please contact Eric Lawton, BLM Wildlife Biologist and member of the Swift Fox Conservation Team, on (202) 452-7760.

Sincerely,



Nina Rose Hatfield  
Acting Director



# United States Department of the Interior

U.S. GEOLOGICAL SURVEY  
Northern Prairie Wildlife Research Center  
8711 37<sup>th</sup> St. SE  
Jamestown, North Dakota 58401-7317

April 3, 2001

Mr. Richard Bischof, Chairperson  
Swift Fox Conservation Team  
Nebraska Game and Parks Commission  
2200 North 33rd St.  
Lincoln, NE 68502

APR 3 2001  
7:PP 2 2001  
GADR M.C.  
DRAFT CHECKS

Dear Mr. Bischof,

On behalf of the US Geological Survey/Biological Resources Division, Northern Prairie Wildlife Research Center, I would like to offer continued active participation and support of the Swift Fox Conservation Team's efforts. This offer comes with one qualification: the Center will be changing leadership within the next year and a new Director may choose to redirect the Center's program. In the meantime, the Center commits to the effort of the Team.

The approach of the Swift Fox Conservation Team, working closely with the U.S. Fish and Wildlife Service to establish recovery guidelines and develop a strategy plan to conserve this species *in lieu* of using the Endangered Species Act should be an example for conservation efforts on behalf of other species. The Team members have successfully assembled available information, developed public education programs, hosted symposiums and workshops, initiated research efforts and shared research information in a cooperative effort that facilitated a better understanding of swift fox ecology and management.

We recognize that the accomplishment of further goals outlined by the Swift Fox Conservation Assessment and Strategy Plan depend on continuing commitments by agencies participating on the team. To that end, Dr. Marsha A. Sovada will continue as an active member of the Team. Dr. Sovada will continue to collaborate with team members on proposals. She will continue to review papers and assist in development of new proposals for team members. When appropriate, Dr. Sovada will submit proposals to acquire new funding to conduct research and she will continue to publish data already collected. The Research Center will continue to maintain and update the swift fox point data, and provide those data to the Team's Habitat Committee for their evaluation of habitat requirements of swift foxes throughout their distribution.

The recent removal of the swift fox from the federal list of candidates for endangered species listing is in part, a result of the hard work of the Team. However, the work is not completed and we plan to continue to be a part of that effort.

Sincerely,

Dr. Ronald E. Kirby  
Director



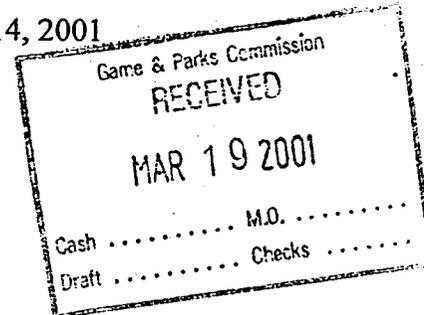
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Lakewood, CO 80228

March 14, 2001



Richard Bischof  
Swift Fox Conservation Team, Chair  
Nebraska Game and Parks Commission  
Wildlife Division  
2200 N. 33<sup>rd</sup> St.  
Lincoln, NE 68503

Dear Mr. Bischof:

In response to your letter of March 1, 2001, APHIS Wildlife Services (WS) is committed to supporting State management plans for the swift fox and abiding by all State rules, regulations, and policies. Our program conducts NEPA analyses on all operational projects, and we regularly monitor our activities as projects progress. Therefore, WS will continue to document swift fox that might be taken during routine predator control projects. We will continue our policy of using trap pan tension devices to preclude accidental capture of nontarget animals such as swift fox. Where practical, WS will continue to support research on swift fox as deemed appropriate by the Conservation Team. We also will continue to support and participate on the Swift Fox Conservation Team.

Sincerely,

Michael V. Worthen  
Director, Western Region

cc:  
Steve Fairaizl, Phoenix, AZ



**SWIFT FOX CONSERVATION TEAM**

revised April 10, 2001

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Greg Schmitt - New Mexico (Co-Chair)

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Habitat - Julianne Hoagland

Reintroduction - Eileen Dowd Stukel - SD

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revised 12/20/00

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## MONTANA SWIFT FOX MANAGEMENT ACTIVITIES

Brian Giddings, Montana Department of Fish, Wildlife and Parks, P.O. Box 200701, Helena, MT 59620-0701 (phone: 406-444-0042; fax: 406-444-4952; e-mail: bgiddings@state.mt.us).

### ABSTRACT

During the 2000 report period, swift fox (*Vulpes velox*) activities consisted of Fish, Wildlife and Parks (FWP) conducting the Montana portion of an international population census with Canada. This census is designed to: 1) replicate the 1996-97 census conducted in Alberta and Saskatchewan; 2) encompass the entire biological population which includes Montana animals; and 3) further evaluate the status of this reintroduced swift fox population by determining changes in distribution and population size, investigating biological parameters, and to assess population viability. In the Montana census area, thirty-four foxes were live-captured in 60 sampled townships during the winter of 2000-2001, which is considered to be a successful sampling effort. Statewide swift fox distribution with land ownership and habitat maps were prepared by FWP to be distributed to the Montana swift fox working group during 2001. The third consecutive year of a five-year swift fox reintroduction by Blackfeet Fish & Wildlife, cooperating with Defenders of Wildlife and Cochrane Wildlife Reserve, was completed with the release of 30 captive-raised animals on the Blackfeet Reservation. About half of the released swift fox were radio-collared and periodically monitored during 2000-2001. Conservation and management activities underway or in development, which relate to Montana's commitment to the national Swift Fox Conservation Team (SFCT) conservation strategy objectives (Kahn et al. 1997) are discussed.

### INTRODUCTION

Montana continues to address the swift fox conservation strategies as outlined in the Conservation Assessment and Conservation Strategy of Swift Fox in the United States (CACCS) (Kahn et al. 1997). FWP has conducted swift fox management or conservation activities annually since 1994, completing activities 1.1.1, 1.1.2, 1.1.3, 2.1.1, 2.1.2, and strategy 10.1 by 1998. Conservation strategy activities that were scheduled for completion by 1999 and are completed or ongoing in Montana include 3.1.1, 3.1.2, 5.1.1, 5.1.2, 5.1.3, 8.1.1 (Giddings 1999). Activity 11.1.1 was completed in 2001. The Montana state working group is currently involved in addressing various activities under strategies 5.2, 6.1, 6.2, 7.1, 8.1, 9.1, 9.2, and 11.2 with most scheduled for completion by 2002 and 2005. FWP's participation in the 2000-2001 international census with Canada will assist Montana in addressing conservation strategies 3.1, 4.1, 5.1, 7.1, 7.2, and 10.1 as results and conclusions are reported over the next two years.

### METHODS

The Bureau of Land Management (BLM) and FWP funded the Montana portion of the international swift fox census with Canada through a \$79,000 federal challenge grant from the National Fish and Wildlife Foundation with a \$54,000 state match. FWP conducted census field activities using a state wildlife biologist and three seasonal personnel that comprised two field crews. A training session covering sampling design, live-capture techniques, and handling procedures was conducted for both U.S.

and Canadian field crews during early November 2000 by A. Moehrenschlager in Calgary, Alberta. FWP and BLM personnel delineated swift fox distribution in north central Montana, based on occurrence data and habitat criteria, which comprised 80 contiguous townships for the census area. Census design called for randomly selecting 75% of these sampling units for a total of 60 townships. Townships were distributed throughout the northern half of Hill, Blaine, Phillips, and Valley counties. Each census unit was then sampled by placing one five-kilometer transect of six traps (1 km apart) along the most centrally located road or trail in the township. Transects placed in adjacent townships were spaced at least six kilometers away. Traps were checked regularly (twice/night) for three consecutive nights and crews followed Canadian trapping protocol (Cotterill 1997). The Montana crews typically ran three transects (townships) concurrently. Field crews operated from mid-November 2000 through mid-February 2001 to complete the 60 townships in the census area. A more detailed description of census design and sampling protocol is provided in Cotterill (1997) and Moehrenschlager (2000). Census methodology reflects field and analysis procedures to investigate population estimates, habitat analysis, disease and parasitology, genetics analysis, and population viability analysis.

FWP prepared GIS-generated land ownership and cover type layers with the swift fox species distribution map to distribute to state working group members in 2001. Swift fox occurrence reports (observation reports, survey results, collected specimens) compiled during the 2000 report period were added to the FWP species database to produce a current distribution map.

The tribal ranch on the Blackfeet Reservation received 30 swift fox for their ongoing reintroduction effort in August 2000, in cooperation with Defenders of Wildlife and the Cochrane Ecological Institute, a captive-breeding facility in Alberta. Defenders of Wildlife purchased radio collars and a receiver for the 2000 release. Approximately half of the released foxes were radio-collared and monitored intensively immediately following the release, then periodically through winter and into spring to locate natal den sites. Ongoing monitoring activities will assist cooperators in evaluating the reintroduction and assess production of wild-born animals (M. Johnson, pers. comm.).

## RESULTS

The Montana portion of the international swift fox census produced 34 captured foxes and 11 recaptures in the 60 townships that were sampled. Foxes were captured in 18 out of the 60 sample units, which were located within Blaine, Phillips, and Valley counties. No foxes were captured in Hill county, although one fox was observed adjacent to a trap transect. The captured sample was comprised of 13 males and 20 females (one not sexed). Field inspection of tooth replacement and wear classified 17 animals as adults and 16 as juveniles (one unclassified). Field crews conducted a total of 1,080 trap nights between mid-November 2000 and mid-February 2001.

Fourteen additional non-census townships were sampled by field crews, which fell within delineated swift fox distribution (80 original townships), in an effort to sample other prairie habitat and the Fort Belknap Reservation. Four captures and four recaptures occurred within three of these additional townships, which were located in Blaine and Valley counties.

A state swift fox distribution map with land ownership layer and cover type layer was completed in 2000 and will be distributed to state working group members for review during 2001. From these maps, working group members will delineate occupied habitat, identify potential dispersal corridors, and classify suitable habitats for population expansion.

Thirty captive-raised swift fox from the Cochrane Ecological Institute were released in August, 2000 on the tribal ranch within the Blackfeet Reservation. The third year of this reintroduction was again funded by Defenders of Wildlife. An overview of the release site and release protocol is provided in Giddings (1998). Defenders of Wildlife provided radio collars for about half of the animals and purchased a receiver/antenna. Released animals were monitored intensively for a week to 10 days immediately following release, while radio collared foxes were periodically monitored during 2000-2001, then located during the spring of 2001 to observe natal den sites.

## DISCUSSION

Over the past two years the Canadian Swift Fox Recovery Team has expressed an interest to include Montana animals in a population census. Their objective is to census the entire biological swift fox population that straddles the international border. This established wild population is a direct consequence of the Canadian swift fox reintroduction program initiated in the mid-1980s. The population currently occupies nearly 200 townships within southeastern Alberta, southwestern Saskatchewan, and north central Montana. Extending the census area into Montana is an effort to evaluate their reintroduction program, by estimating the size of the adjacent Canada/U.S. populations, for a contiguous biological population estimate. The 1996-1997 census estimated a population size of 289 animals (range 179-412) in Canada based on 32 captured foxes. The 2000-2001 census will provide a comparison to assess the Canadian post-reintroduction goal of a self-sustaining population. The Canadian swift fox recovery team is also investigating habitat preference, disease, genetics, and population viability. The viability analysis will address the long posed question by the U.S. Fish and Wildlife Service regarding sustainability of swift fox populations. This Canadian census design could be used in other areas within U.S. swift fox range to also address this question.

FWP considers determination of current swift fox distribution in Montana as a significant step toward state and national efforts with regards to population monitoring activities and specific conservation measures. The 2000-2001 census will assist FWP in further defining population distribution with new information on population status and trend (in Canada). This information will be particularly helpful in providing baseline data for later comparison with future monitoring activities in the state. Results and conclusions from the 2000-2001 census will be analyzed and reported by A. Moehrenschrager over the next two years in peer-reviewed scientific publications.

FWP will provide maps to working group members in 2001 that delineate swift fox distribution in relation to land ownership patterns and vegetative cover types in Montana. It is anticipated that working group activities and these mapping efforts will lead initially to conservation planning on the part of federal land management agencies. The working group will help coordinate future activities directed at habitat protection and maintaining habitat connectivity. This mapping effort is intended to facilitate

species conservation planning through land management activities or habitat protection efforts. Potential dispersal corridors, based on land ownership patterns and presence of suitable swift fox habitat, will be identified to provide future connectivity between the U.S./Canadian population and adjacent northern populations south of Montana.

The Blackfeet Reservation release site is located in suitable swift fox habitat where foxes have access to additional tracts of extensive prairie grasslands, primarily to the south. A resident wild swift fox population (U.S./Canada) exists approximately 90 miles from the Blackfeet reintroduction area. A swift fox distribution survey conducted by FWP in 1999 indicates that some foxes may be present between these populations (Giddings 1999). During the third year of this five-year program, there is good evidence that released animals have survived and population establishment is occurring (M. Johnson, pers. comm.). Natal den sites have been located each of the past three years and observed with wild-born pups. Approximately half of the released captive-raised foxes were monitored from the 2000 release (M. Johnson, pers. comm.). This effort will aid in evaluating the reintroduction program by documenting mortality, survival, dispersal distance, residency, natal den sites locations, and reproductive success or recruitment. The increased interest in utilizing radio telemetry will provide a more scientifically based evaluation. This privately funded program has the potential to help promote species restoration in Montana and the northern range of the swift fox in the U.S.

#### CONSERVATION STRATEGY ACTIVITIES

Status of swift fox conservation strategy action items scheduled for completion in 1999:

8.1.1 Completed. Swift fox distribution and suitable habitat maps and data will be available and provided to state working group members and cooperators during 2001.

Status of swift fox conservation strategy action items scheduled for completion in 2002:

6.1.1, 6.1.2, 6.1.3, 6.2.1, 7.2.3, 9.1.1, 9.1.2 Ongoing to be initiated or completed by 2002.

#### LITERATURE CITED

- Cotterill, S.E. 1997. Population census of swift fox (*Vulpes velox*) in Canada: Winter 1996-1997. Prepared for the Swift Fox National Recovery Team. Alberta Environmental Protection, Natural Resources Service, Wildlife Management Division. 50 pp.
- Giddings, B. 1999. Montana swift fox management activities. Pages 191-201 in Schmitt, C.G., ed. 1999 Swift Fox Conservation Team Annual Report. New Mexico Dept. Game & Fish. Santa Fe, New Mexico. 201 pp.

- Giddings, B. 1998. Swift fox management activities in Montana. Pages 18-22 *in* Roy, C.C., ed. 1998 Swift Fox Conservation Team Annual Report. Kansas Dept. Wildlife & Parks. Emporia, KS. 107 pp.
- Kahn, R., L. Fox, P. Horner, B. Giddings, and C. Roy. 1997. Conservation assessment and conservation strategy for swift fox in the United States. Division of Wildlife. Denver, CO. 54 pp.
- Moehrenschlager, A. 2000. 2000/2001 swift fox population assessment. Unpubl. Rept. Conservation Research, Calgary Zoo. Calgary, Alberta. 8 pp.

## SWIFT FOX COMPLETION REPORT

STATE OF WYOMING      NONGAME MAMMALS – Species of Special Concern

PERIOD COVERED: 16 April 2000 – 15 April 2001

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### INTRODUCTION

The purpose of distribution surveys conducted in 2000, and 1999 was to document recent locations of swift fox (*Vulpes velox*) in Wyoming. Baited track plates placed in a continuous transect up to several miles long with a track plate spacing of 1.6 km (1 mi) between plates was found to be the most effective method for documenting swift fox in areas with potential habitat but unknown population status (Dieni et al. 1997). To establish transect locations, suitable areas of swift fox habitat were determined and randomly selected sections (1 mi<sup>2</sup>) within the areas identified (Olsen et al. 1999).

Surveys to develop baseline transects for monitoring long-term population trends will begin in 2001. These trend surveys will occur in locations documented to have swift fox during the 1999 and 2000 distribution surveys. Survey methods previously developed will be used (Olson et al. 1999). Transects for monitoring population trend will use a more intensive survey method (five track plates at a spacing of .8 km (.5mi) between plates). Approximately 20 transects will be surveyed in each of three geographic regions with each transect no closer than 5 miles to another. The method is based on previous findings and estimates that there is an 88% probability that a swift fox will be detected if it occupies an area.

Repetition of the 2001 surveys in 2006 will document the long-term trend for the species.

According to Woolley et al. 1995, the current population occurs primarily in three geographic regions: 1) Laramie Valley and Shirley Basin in Albany and Carbon counties, 2) Southeastern Plains—parts of Laramie, Platte and Goshen counties, and 3) Powder River Basin- parts of Converse, Natrona, Weston and Niobrara counties. Surveys were conducted in the Laramie Valley and Shirley Basin areas in 1999. The second and third regions were surveyed in 2000.

### METHODS

Track plates were made of 16-gauge sheet steel, measured 61cm x 61cm (2ft. x 2ft.) painted with two coats each of gray primer and gray paint. A one-gallon weed sprayer was used to coat the plates with talc and ethyl alcohol mixture, the ratio used was 2.5 cups talc: 1 gallon 95% ethyl alcohol. This mixture will prepare 40-50 plates. Approximately 15g of stirred jack mackerel were placed in the center

of the plate as an attractant. Plates were spaced 1.6 km (1 mi) apart within public road easements where tracks could be observed without requiring private land access. Track plates were placed along an existing fence if one was present. When a fence was not present, plates were placed 10 m to 25 m from the centerline of the road.

Flagging marked locations of plates and a GPS location in UTM coordinates was recorded for the center track plate of each transect. Track plates were observed for a maximum of four nights. Track plates were picked up for 5 miles on either side of a swift fox track occurrence after the first night swift fox use was documented to prevent duplicate recordings of the same animal (Olson et al. 1998). During periods of heavy rain plates were left in-place for up to five nights.

Track measurements of swift fox were recorded and lifted for future reference with 2-inch clear packing tape. In some cases, clear contact paper was used to preserve an entire track plate for future use in identifying tracks. Plates were cleaned with a stiff brush or steel wool before reuse.

Baseline transects used during the 2001 trend monitoring survey will be those locations with positive identification of a swift fox track on a track plate during the 1999 and 2000 surveys or known den sites. Recorded den sites along roads will be used as center locations for baseline transects.

## RESULTS

Surveys from 9 September through 25 October 2000 attempted to sample potential swift fox habitat (shortgrass and mixed grass prairies) in Converse, Goshen, Laramie and Weston counties. Total linear sample was 323 km (201 mi) compared with the 1999 survey of 1304 km (815 mi). Four hundred eighty-seven track plate nights using 160 track plates detected 16 swift fox detections with 2 discrete locations compared with the 1999 survey in which 371 track plates with 1185 track plate nights produced 70 detections with 24 discrete locations (Luce et al. 2000).

Ten swift fox locations, including three den sites were recorded in Laramie County (161 track plate nights). Six locations, including one den site and 2 discrete locations were recorded in Goshen County (104 track plate nights). During 198 track plate nights in Weston County and Converse County no swift fox were detected. In 1998 the Douglas Ranger District documented 22 suspected swift fox locations on or near Thunder Basin National Grassland (Sidle 1998) and previously Woolly et al. 1995 listed 37 locations of fox observed on track plate and spotlight surveys.

When a track plate location and a den site occurred within 8 km (5 mi) of each other, the den site was used as the baseline location rather than the track plate location. These observations were included in the list of baseline transect locations.

The 2000 distribution survey resulted in 17 swift fox locations in Laramie and Goshen Counties (Southeast Plains). During late-winter, early-spring 2001 a detection survey will be conducted in Weston County and Converse County (Powder River Basin) to acquire the 20 baseline transects required

for each region during 2001 trend monitoring survey.

## **DISCUSSION**

Surveys for swift fox in 2000 were designed to establish a sufficient sample size of occupied fox locations to serve as transect locations for monitoring population trends. Short and mixed grass prairies mostly devoid of heavy shrub coverage characterized areas where swift fox were most commonly found. Selection of survey routes took into account random swift fox observations made by USDA -Wildlife Services, Wyoming Game and Fish Department, and Wyoming Cooperative Fish and Wildlife Research Unit personnel.

In contrast with other prairie mammals in Wyoming swift fox tracks demonstrated unique characteristics. Swift fox tracks were differentiated from red fox in that red fox prints are 15 - 20 mm longer and 10 - 15 mm wider. Coyote tracks are similar to red fox though they have slightly wider measurements and less hair between paw pads than do red fox. Claw impressions of canines on track plates are rarely detected compared to tracks of the same animal in softer substrates. White-tailed jackrabbit front tracks were similar to swift fox but distinguishable by the amount hair distorting the shape of toe and palm pads. These tracks looked similar to pressing a cotton ball on the surface of the track plate. Usually the front tracks were accompanied by the much longer hind tracks. Rodents and cows may have affected the number of fox detections by taking attractant or smudging plates. Since impressions of grassland mammal tracks appear slightly different on track plates than on softer surfaces such as mud, sand, and snow, it is recommended that each project preserve track plates of separate species for comparison.

The monitoring method is designed to detect declines in the population based on the findings that there is an 88% probability of detection from one year to the next. Resurveying baseline locations in the year 2006 will provide swift fox population trends.

## **LITERATURE CITED**

- Dieni, J.S., F. G. Lindzey, T. P. Woolley, and S. H. Anderson. 1997 Swift fox investigations I n Wyoming: Annual Report. Wyoming Cooperative Fish and Wildlife Research Unit, Laramie, WY.
- Luce, B., L. Hunt and J. Priday. 2000. Swift fox completion report. Pages 129-133 *in* Threatened, Endangered, and Nongame Bird and Mammal Investigations. Wyoming Game and Fish Department, Cheyenne. 249pp.
- Olson, T. L., F. G. Lindzey, and J. S. Dieni 1999. A proposed protocol for monitoring swift fox in Wyoming. Unpublished manuscript. Wyoming Coop Research Unit. Laramie, WY. 12pp.

Olson, T.L., F. G. Lindzey, and J. S. Dieni 1998. Swift fox Detection Probability in Southeast Wyoming. Pages 51-65 in C. C. Roy ed. 1998 Swift Fox Conservation Team Annual Report. Emporia, KS.

Side, J. 1998. 1998 Swift Fox Survey – Thunder Basin National Grassland – Douglas Ranger District. Pages 75-78 in C. C. Roy ed. 1998 Swift Fox Conservation Team Annual Report. Emporia, KS.

Woolley, T.P., F.G. Lindzey, and R. Rothwell. 1995 Swift Fox Surveys in Wyoming – Annual Report. Pages 61-76 in S.H. Allen, J. Whitaker Hoagland, and E. Dowd Stukel, eds. Report of the swift fox conservation team 1995. Bismarck, ND.

## SWIFT FOX INVESTIGATIONS IN NEW MEXICO, 2000

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The second year of a three-year study of the population and general ecology of swift fox (*Vulpes velox*) in New Mexico has been completed. As described in last year's Swift Fox Conservation Team annual report (Harrison 2000), the primary goal of current research is to determine the method of population census most appropriate for swift fox in New Mexico. Both absolute and relative estimation methods are being examined. Emphasis is placed upon methods which would be most practical for statewide surveys given the limited financial and labor resources of New Mexico. Secondary goals are to study demographic parameters, home range size, diet, den site selection, and threats to swift fox populations.

Activities this year included trapping and radio collaring foxes, testing scent stations, searching for tracks, calling, analysis of DNA in scat, population and density estimation, home range size estimation, observing numbers of pups at dens, assessment of age at date of death and causes of death, determination of sex ratio, scat collection, lure testing, generating habitat maps, observation of habitat outside of the study area, and updating landowners on the progress of the study. This report describes activities prior to January 8, 2001.

### STUDY AREA.

The study area is located in the western unit of the Kiowa National Grasslands, located northeast of Roy, NM, in Harding and Colfax counties. The study area includes private, state, and federal lands. Permission to enter private land has been obtained from all landowners within the core of the study area. Each year landowners and grazing permittees receive a letter updating them on progress of the study.

Habitat within the study area is entirely short-grass prairie (described as plains-mesa grassland by Dick-Peddie 1993). Dominant plant species are blue grama (*Bouteloua gracilis*), hairy grama (*B. hirsuta*), western wheatgrass (*Elymus smithii*), threeawn (*Aristida sp.*), and needle and thread (*Stipa comata*). The most common shrubs are broom snakeweed (*Gutierrezia sarothrae*) and *Yucca*. Snakeweed is extensive in some sections, but *Yucca* occurs only in isolated stands. Topography is low rolling hills and elevation varies from approximately 1700 to 1900 m (5570 to 6200'). Annual precipitation averages 429 mm (16.9"), with most precipitation occurring as summer rainfall. Average low and high temperatures are 3.1°C (37.5°F) and 18.8°C (65.8°F), respectively.

## METHODS

Two methods to determine the absolute number of foxes within the core study area are being examined: intensive trapping combined with resighting at bait stations with automatic cameras, and DNA analysis of scat. Intensive trapping was conducted from September through November, 1999. Traps were placed at one-half or one-mile intervals and operated for four nights. Foxes were trapped with 25 cm x 30 cm x 81 cm single door traps (Tomahawk Traps, Tomahawk, WI) baited with beef scraps and a cod liver oil - mackerel lure (Trailing Scent, On Target A.D.C., Cortland, IL). Captured foxes were fitted with a radio collar and marked for individual visual identification by dyeing a unique portion of their fur with commercial hair dye (Miss Clairol black velvet).

Radio collars were provided by Advanced Telemetry Systems (model 16MC, Isanti, MN) and Telonics (model MOD-080, Mesa, AZ). The receiving antenna consists of two five element Yagi antennas combined 180° out of phase (null) mounted through a sunroof in the cab of the research vehicle. Automatic cameras using active infrared sensors (Trailmaster 1500 with TM 35-1 camera kit and Tm1500 Photo System, Goodson & Associates, Lenexa, KS) at bait stations were used to locate unmarked foxes. Bait was canned mackerel and Trailing Scent. Camera stations were operated from November, 1999, through February, 2000. Cameras were placed at one-mile intervals and operated for four nights. Absolute population size was estimated using a Lincoln-Peterson estimate for closed populations (Pollock et al. 1990). The area sampled was assumed to be one average home range size wide on each side of surveyed roads, based upon home range sizes observed from June through December, 1999.

Absolute population estimates may also be made using DNA obtained from scat and mark-recapture or rarefaction techniques (Kohn et al. 1999). An arrangement was made with Dr. Jerry Dragoo at the University of New Mexico to develop DNA methods for swift fox. Marsha Sovada (U.S. Geological Survey, North Dakota) provided control scat and blood samples to Dr. Dragoo from captive swift fox. A sample of 194 scat were collected from the study site during the period of the camera surveys.

Methods studied to determine presence/absence and relative numbers of swift fox included scent stations, searching for tracks, trapping, calling, and collecting scat.

The goal of testing scent stations is to determine what time period of observation and what spacing between stations is best to detect foxes in an area. Automatic cameras were used to determine if foxes visiting stations were marked or unmarked. Scent stations consist of 76 cm x 76 cm areas cleared of vegetation and covered with a 1:32 mixture of mineral oil and dried plaster sand. Stations are baited with a mixture of cod liver oil and mackerel (Trailing Scent, On Target A.D.C., Cortland, IL) and approximately 4 cm<sup>3</sup> of canned mackerel. Five scent stations with cameras were placed in a transect within the home ranges of radio collared foxes and observed for six nights. Visitation data was subsampled to determine the percentage of transects visited as a function of number of stations per home range (i.e., spacing between stations) and number of nights observed.

Additional details of methods may be found in Harrison (2000).

## PRELIMINARY RESULTS AND DISCUSSION.

Trapping combined with camera resighting worked well. The 95% confidence intervals for total population size were 15 to 41 foxes in December, 1999, and 12 to 25 foxes in February, 2000. The area surveyed was estimated to be 242 km<sup>2</sup> (93.6mi<sup>2</sup>). The 95% confidence intervals for estimated fox density were 0.06 to 0.17 foxes/km<sup>2</sup> in December, 1999, and 0.05 to 0.10 fox/km<sup>2</sup> in February, 2000. These estimates are conservative (i.e., probably slightly low) due to maximizing the estimate of area surveyed and minimizing the number of unmarked foxes seen. A second population survey is currently underway.

By using trapping combined with camera resighting, we did not violate the assumption that individual animals captured (trapped) during the first survey are less likely to be captured (photographed) during the second survey (Pollock et al. 1990). However, infrared-triggered camera units are expensive (Trailmaster 1500 active infrared game monitor with photographic software and camera: \$640; Trailmaster 500 passive infrared game monitor with photographic software and camera: \$560. Protective boxes, mounting stakes, film, film processing are additional). The high cost of the camera resighting technique limits its use to small areas. Trapping and retrapping is more efficient than trapping/resighting for statewide surveys, although trapping/retrapping does violate certain statistical assumptions.

Progress toward developing DNA methods for surveying swift fox has been very slow. Dr. Dragoo initially did not devote as much time to the project as promised, although he has spent more time recently. Several DNA extraction methods have been examined and one selected. Contamination problems also slow progress. Dr. Dragoo has confirmed that the control scat originated from swift foxes, has identified 12 of 13 individual control animals by their scat, and has begun processing the field-collected scat. Despite numerous inquiries nationwide, no commercial laboratory has been found to do this work. Apparently extracting and analyzing DNA from scat is a very difficult process and existing wildlife genetics laboratories are too small to undertake scat work. For now field collection of suspected swift fox scat will probably serve primarily only as an indication of swift fox presence which must be confirmed by trapping, scent stations, or other methods. At this point, the use of scat DNA analysis appears to be limited to research-oriented projects done in university labs. It does not appear to be useful for statewide surveys of swift fox presence. We expect this situation to change as technology is developed to make DNA analysis easier and as demand increases.

Tests of scent stations have been conducted within the home ranges of ten marked foxes to date. A total of 270 station-nights of observation were conducted. Unmarked and marked foxes combined made 97 visits to stations (35.9%). The percent of transects visited by marked and unmarked foxes combined, and marked foxes only, as a function of number of nights and number of stations is presented in Figures 1. and 2. Detection rate increased smoothly as the number of stations per home range and the number of nights observed increased. Given the observed home range sizes (see below) and assuming circular home ranges, placing five stations in each home range requires a spacing between stations of 0.6 mile (1

km), placing four requires a spacing of 0.8 mile (1.3 km), placing three requires a spacing of 1.0 mile (1.7 km), placing two requires a spacing of 1.6 mile (2.6 km), and placing one requires a spacing of 3.1 miles (5.2 km) or greater. Observation of marked foxes only represents a lower fox density situation than observation of all foxes. However, placement of transects was often restricted by available roads and on several transects telemetry revealed that marked foxes did not use portions of their home ranges where scent stations were located during the observation period. Often unmarked foxes were detected at those stations. Our observations of marked foxes only likely produces a low estimate of the percentage of transects that will detect foxes.

Based upon the observed sample, detection rate is nearly maximized at three nights for all foxes and four nights for marked foxes only. In practice, the number of stations that may be set will likely be limited by the time available and size of the area to be surveyed. For range-wide surveys in New Mexico, scent station transects consisting of stations spaced at one-mile intervals and operated for three nights appear to be the most practical. For more intensive examination of specific areas, operation for an additional night would produce approximately the same increase in percent detection as decreasing the spacing to 0.8 mile. Even with the most intensive surveys, some foxes will likely remain undetected.

The ideal number of stations per transect depends upon the dispersion of fox home ranges across the landscape. Dispersion information from our study area is limited. In areas where foxes have been found, home ranges are within one mile of each other. However, only transient animals have been trapped within one six-mile gap between home range areas. At present there is no obvious reason why foxes are not using the gap area. To cover a six-mile gap and include three stations within fox home ranges, transects should be at least ten stations long if stations are separated by one mile. However, recent unpublished work by Glen Sargeant (Northern Prairie Wildlife Research Center) indicates that stations scattered randomly across landscapes may work as well as transects.

The number of scent station transects observed to date was limited by the number of camera units and foxes with known home ranges available. Subsampling of the scent station data increased the number of transect data points, but did introduce pseudoreplication. The results did not change appreciably from the analysis done last year with three transects to that done with ten transects, however.

The sample size (number of transects) necessary to detect a change in population may be estimated assuming a binomial distribution of transect visits (Zar 1984:399). The results depend upon the level of Type I and Type II errors required. A Type I error ( $\alpha$  error) results when it is believed the population changed when it really did not. A Type II error ( $\beta$  error) occurs when a real population change is not detected. In conservation situations Type I errors are less important than Type II errors, thus  $\alpha$  may be relaxed from the standard 0.05, while  $\beta$  should be relatively low, such as 0.1 or .05. For example, to decide whether or not a decrease of 20% in the proportion of transects visited between two years represented a real population decrease, and assuming  $\alpha = 0.2$  and  $\beta = 0.1$ , and detection rate = 60%, 65 independent transects each year would be required. Assuming  $\alpha = 0.1$  and  $\beta = 0.1$ , 90 transects would be required. Such numbers of transects are not impractical.

The required number of independent transects determines the minimum area that can be sampled. For transects to be independent, they should be separated by at least one average home range diameter in all directions. Surveys of 65-90 transects require a minimum area approximately the size of New Mexico counties. Lack of road access will enlarge the minimum area sampled. For comparison, Harrison and Schmitt (1998) used 80 transects to survey the eastern one-third of New Mexico.

Searches for tracks have continued since the previous year. Clear swift fox tracks were observed on only one occasion. Precipitation was too infrequent to produce sufficiently wet soils. As observed last year, soils in the study area, and in New Mexico in general, are too hard, sandy, and dry to take and hold identifiable swift fox tracks. Track surveys will not be studied further.

To date, 32 foxes (15 M, 17 F) have been captured and radio collared. Overall trapping success in 654 trap nights from January, 1999, through January, 2001, was 4.6 % without recaptures, and 6.4% with recaptures. Trapping success was somewhat higher in September-October 1999 (5.9% without recaptures) and November-December 2000 (5.7% without recaptures) than in January-March 1999 (3.9% without recaptures) and January-March 2000 (1.6% without recaptures). For comparison, 73.3% of scent stations were visited by foxes within the first four nights, the time period in which traps were usually open. Overall, foxes visited scent stations during 36.8% of station-nights. Setting traps takes less time than making scent stations, but the number of traps that can be set within a given field trip is less than the number of scent stations that can be set due to vehicle space limitations. Trapping is considerably less efficient than scent stations, although trapping does provide positive species identification.

Ten attempts to call foxes into visible or audible range using recorded animal sounds were made. One fox responded to the calls, approached the vehicle and vocalized. No other foxes responded even though telemetry indicated they were within range of the sounds. Calling is limited by wind noise and available roads and can disturb homeowners. Foxes appear to be wary of vehicles and may have been reluctant to approach. Calling is not an efficient technique and will not be studied further.

A test of the efficacy of scent lures to increase scat deposition was made. All scat were collected from 64 conspicuous locations. A lure known to attract foxes (cod liver oil and mackerel) was deposited at 33 locations. Scat deposition one month later was insufficient for analysis, so all locations were re-examined six months later. No significant enhancement of scat deposition was found.

Twelve marked foxes (4 M, 8 F) have been found dead to date. Interference competition by coyotes was the most likely explanation for nine deaths. Two foxes were found cached, also probably by a coyote. One fox was found dead in a den. One unmarked pup was found dead due to a vehicle strike. Six fox mandibles have been submitted to Matson's Laboratory for age analysis. Four females were juveniles, one female was one year old, and one male was two years old.

Survival was estimated using a Kaplan-Meier estimator with a staggered entry design (Pollock et al. 1989). Overall survival for one year for adults and juveniles was 0.526 (95% C.I. .302-.750), for adults only was 0.677 (95% C.I. .410-.944), and for juveniles only was 0.313 (95% C.I. 0-.673). Adult female

survival (0.278, 95% C.I. .047-.509) appeared to be lower than adult male (.762, 95% C.I. .465-1.0), although the confidence intervals overlap slightly.

Observations of pups were made at four dens, beginning in early June. Loss of females limited the number of dens observable. Two pups were observed at two dens and one at each of two dens. One pup disappeared from the former dens by July and one mother died in July, presumably resulting in the death of her one pup. A local Wildlife Services official related that he regularly sees 3-4 pups each year at a den near his home. The male:female sex ratio of foxes trapped to date is 15:17.

Average 95% adaptive kernel home range size for seven males and four females with over 30 relocations was 21.8 km<sup>2</sup> (range 8.0-36.6 km<sup>2</sup>, 8-23 months, 31-137 points). Average male home range size was 25.3 km<sup>2</sup> (range 20.5-36.6 km<sup>2</sup>, 14-23 months, 33-137 points). Average female home range size was 15.7 km<sup>2</sup> (range 8.0-25.8 km<sup>2</sup>, 8-14 months, 31-77 points). Two male foxes appeared to abandon portions of their home ranges. Without the abandoned portions and limiting the length of observation to one year, the average home range size was 20.0 km<sup>2</sup> for all foxes and 21.9 km<sup>2</sup> for males. Average home range sizes for foxes observed for approximately one year were 21.5 km<sup>2</sup> for all foxes (7 males, 1 female), 21.9 km<sup>2</sup> for seven males, and 17.8 km<sup>2</sup> for one female, excluding abandoned areas. Female range sizes appear to be smaller than males', but observations of females were very limited due to deaths.

To address conservation and management of the statewide swift fox population, habitat maps were downloaded from the U.S. Geological Survey (<http://edcwww.cr.usgs.gov/doc/edchome/ndcdb/ndcdb.html>). Maps of habitat and land use covering the entire range of swift fox in New Mexico were generated. The maps correctly delineated the extent of short-grass prairie at the statewide level, but areas of high shrub density in eastern New Mexico in which swift foxes were not found by Harrison and Schmitt (1998) were not distinguished from grassland areas occupied by foxes. No completely adequate habitat maps have been found.

An informal habitat survey by vehicle was conducted in the vicinity of Tucumcari, NM. Harrison and Schmitt (1998) found a potential gap between northern and southern New Mexico populations of swift fox in this area. Unsuitable habitat there was observed to be sufficiently widespread to create such a gap. Whether or not the current habitat is natural or anthropogenic is not known. If it is natural, in the past the northern and southern swift fox populations could have been connected through short-grass prairie areas in Texas. However, the latter areas are now almost entirely converted to cropland and swift fox are not present (Mote 1996). If the southern swift fox population is indeed isolated from other swift fox populations, over time it will likely become more similar to kit fox populations through hybridization with southern New Mexico kit foxes.

## LITERATURE CITED

- Dick-Peddie, W. A. 1993. *New Mexico vegetation, past, present, and future*. University of New Mexico Press, Albuquerque, New Mexico, USA.
- Harrison, R. L. 2000. Swift fox investigations in New Mexico, 1999. Pages 38-45 in C. G. Schmitt, ed. *Swift Fox Conservation Team 1999 Annual Report*. New Mexico Department of Game and Fish. Unpublished report.
- Harrison, R. L., and C. G. Schmitt. 1998. Current swift fox distribution and habitat selection within area of historical occurrence in New Mexico. Presented at the First North American Swift Fox Symposium, Saskatoon, Canada. To be published with symposium proceedings.
- Kohn, M. H., E. C. York, D. A. Kamradt, G. Haught, R. M. Sauvajot, and R. K. Wayne. 1999. Estimating population size by genotyping faeces. *Proceedings of the Royal Society of London B* 266:657-663.
- Pollock, K. H., S. R. Winterstein, C. M. Bunck, and P. D. Curtis. 1989. Survival analysis in telemetry studies: the staggered entry design. *Journal of Wildlife Management* 53(1):7-15.
- Pollock, K. H., J. D. Nichols, C. Brownie, and J. E. Hines. 1990. Statistical inference for capture-recapture experiments. *Wildlife Monographs* No. 107.
- Zar, J.H. 1984. *Biostatistical Analysis*. Second edition. Prentice-Hall, Englewood Cliffs, NJ.

Nebraska Swift Fox Report, 2000

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During most of 2000 the position of the furbearer/non-game mammal Program Manager with the Nebraska Game and Parks Commission was vacant. As a result no swift fox related activities were conducted during that year. A scent station survey in the Nebraska panhandle is planned for 2001.

## SWIFT FOX INVESTIGATIONS IN OKLAHOMA, 2000

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PROJECT TITLE: Population Distribution of Swift Fox in Northwestern Oklahoma Using a Track Search Survey

### ABSTRACT

The swift fox (*Vulpes velox*) monitoring survey was conducted in portions of six Oklahoma counties (Cimarron, Texas, Beaver, Harper, Ellis, and Woodward) in order to investigate the species' distribution within its historical range. Six personnel from the Oklahoma Department of Wildlife Conservation conducted the track search surveys. During 1999, swift fox were detected in 43 of 114 townships throughout the entire study area. During 2000, swift fox were detected in 36 of 101 townships surveyed. All townships where swift fox tracks were successfully detected for both 1999 and 2000 occurred in the panhandle region of Cimarron, Texas and Beaver counties. Swift fox tracks were observed 68% of the time in rangeland land use type in 1999 and 74% in 2000.

### INTRODUCTION

The swift fox (*Vulpes velox*) is classified as a furbearer species in Oklahoma with a year-round closed season with regard to take. The swift fox is also designated as a state species of special concern in Oklahoma. The swift fox has been documented to occur in the panhandle region as well as in four counties in the northwestern corner of the body of the state. Historically, the swift fox was considered to occur throughout the Oklahoma panhandle counties of Cimarron, Texas and Beaver, and in the three northwestern counties; Harper, Woodward and Ellis (Caire et al. 1989, Duck and Fletcher 1945). Swift foxes were observed in Texas and Beaver counties during the 1950s and 1960s by several researchers (Cutter 1959, Glass 1959, Kilgore 1969). A 1988 landowner survey conducted by the Oklahoma Department of Wildlife Conservation (ODWC) produced 21 swift fox sightings and eight den locations in the panhandle region (Kocka 1988). Additionally, five verified swift fox sightings between 1988 and 1994 by ODWC biologists were reported from Cimarron, Texas, Beaver and Roger Mills counties (Hoagland 1996).

From 1998 through 2000, Section 6 funds were available to conduct a swift fox population distribution survey in northwestern Oklahoma, by using a systematic track search survey. The objectives of this project were to: establish a track search survey to monitor population trends of swift foxes throughout the shortgrass High Plains ecoregion in Oklahoma; and develop a baseline database of swift fox distribution and abundance in northwestern Oklahoma. The track survey also allowed the populations of all terrestrial furbearer species to be monitored in the region. Data collection was initiated in August 1998 and is scheduled to be completed in September 2000. The project is being conducted by the Oklahoma Department of Wildlife Conservation (ODWC).

## METHODS

Six ODWC personnel, four county game wardens and two wildlife biologists, conducted the track search surveys. All ODWC personnel were knowledgeable in reading furbearer tracks and with the area and local wildlife to be surveyed. The study area was defined as the shortgrass High Plains ecoregion that occurred within the historical swift fox range in Cimarron, Texas, Beaver, Harper, Ellis, and Woodward counties. Every other township in the identified study area was surveyed for furbearer tracks. Survey sites within each township were carefully selected, based on areas with the highest probability of finding swift fox tracks if swift foxes were present. Thus, survey locations focused on areas with herbaceous range habitat, flat terrain, the best available substrate for tracks, little vehicle traffic, and a lack of human disturbance. The same tracking sites were used each year unless major changes occurred that required new sites to be selected.

All track surveys were conducted during the months of August and September, during all three years. Fifty-seven townships were identified to be surveyed for swift fox tracks during 1998 while 114 townships were targeted for track searches during 1999. Prior to the 2000 survey, nine townships in Harper and Ellis counties were re-evaluated for their potential as swift fox habitat and whether they occurred within the Shortgrass High Plains ecoregion. If more than 75% of the township was outside of the Shortgrass High Plains ecoregion with habitat unsuitable for swift fox, the township was eliminated from the 2000 survey. As a result, 105 townships were targeted for track searches during 2000.

Track searches were conducted with a minimum search time per township of 30 minutes and a maximum of 2 hours. Once a swift fox track was found, the time of search was recorded. The tracker continued searching if the track was found during the first 30 minutes of the search period, or moved on to the next township, after the initial 30 minutes. Since survey success was affected by time of day and weather conditions, track searches were conducted when possible during morning hours and 24 hours following a rainfall event, when possible.

For the purpose of selecting track search locations, broad habitat categories were delineated within the study area by using ArcView GIS 3.0, based on United States Geological Survey (USGS) land use and land cover data at 1:250,000 (USGS 1990). Classification codes used in data analysis included urban/industrial, cropland, including Conservation Reserve Program grasses (CRP), herbaceous rangeland, shrub rangeland, mixed rangeland, deciduous forest, evergreen forest, and water/wetlands. Habitat categories were ground verified for the townships surveyed. The habitat type recorded where swift fox and other furbearer tracks were located was recorded as range, CRP, fallow, winter wheat, irrigated crop (e.g. corn), other crop (e.g. milo, soybeans), and juniper mesa.

## RESULTS

During 1999, all 114 townships in the targeted study area were successfully searched for swift fox tracks. Trackers drove an average of 37 miles per township and averaged 8 days to complete the surveys. Swift fox tracks were detected in 43 (37.7%) of the townships surveyed (Figure 1). For each

township where swift foxes were successfully detected, it took an average of 46 minutes to detect the first track; range 0 to 103 minutes. Swift fox tracks were detected within the first 30 minutes in 14 of the 43 townships. In 32 townships, swift fox tracks were found within the first hour. Swift fox tracks were found during the second hour of tracking in 11 townships. Forty townships had only one set of swift fox tracks observed during the initial 30 minutes; three townships had two sets of swift fox tracks detected within the initial 30 minute search interval.

During 2000, 101 of the 105 targeted townships were successfully searched for swift fox tracks. Trackers drove an average of 39 miles per township and averaged 8 days to complete the surveys. Swift fox tracks were detected in 36 (35.6%) of the townships surveyed (Figure 1). For each township where swift foxes were successfully detected, it took an average of 36 minutes to detect the first track; range 0 to 117 minutes. Swift fox tracks were detected within the first 30 minutes in 17 of the 36 townships. In 25 townships, swift fox tracks were found within the first hour. Swift fox tracks were found during the second hour of tracking in 11 townships. Thirty-four townships had only one set of swift fox tracks observed during the initial 30 minutes; two townships had more than two sets of swift fox tracks detected within the initial 30 minute search interval.

In Cimarron and Texas counties, where data were available for all three years, the number of townships where swift fox tracks were detected declined from 35 townships in 1998 to 24 townships in 1999 and 21 townships in 2000 (Table 1). The average time it took to detect swift fox tracks, if they were found, however fluctuated only slightly from 39 minutes in 1998 to 46 minutes in 1999 and back to 41 minutes in 2000. The number of townships where swift fox tracks were observed within the first 30 minutes declined from 17 townships in 1998 to five townships in 1999, but rebounded to 11 townships in 2000 (Table 1). Swift fox tracks were not found more than one time within the first 30 minutes in any township during 1999, compared to seven townships where more than one set of swift fox tracks was observed in 1998 and in two townships in 2000 (Table 1).

During 1998, 42% of sites where swift fox tracks were observed in Cimarron and Texas counties had soil tracking conditions that were considered good to excellent, while in 1999, this percentage dropped to 34% (Table 2). The summer of 2000 was an extreme drought year and this percentage dropped to 8% (Table 2). The percentage of surveys conducted within one to three days following a rainfall event also dropped from 74% in 1998 to 51% in 1999 to 5% in 2000, while the percentage of surveys conducted more than three days following a rainfall increased from 21% to 42% to 93% between 1998 and 2000 (Table 2). The percentage of track search surveys conducted while winds were between one and five miles per hour decreased between 1998 and 1999 from 68% to 44%, but increased to 53% in 2000. While the percentage of surveys conducted when wind speeds were greater than five miles per hour increased from 32% to 56% between 1998 and 1999 but decreased to 47% in 2000 (Table 2).

Table 1. Comparison of swift fox track detection statistics in Cimarron and Texas counties from 1998 to 2000.

Swift Fox Tracking Variables Recorded	1998	1999	2000
Townships surveyed	57	57	57
Townships with swift fox tracks	35	24	21
Average time to first track in minutes	39	46	41
Townships with tracks observed within first 30 minutes	17	5	11
Townships with >1 set of swift fox tracks observed	7	0	2

Table 2. Soil tracking conditions, days since last rain, and wind conditions recorded during swift fox surveys in Cimarron and Texas counties from 1998 to 2000.

Environmental Conditions	1998	1999	2000
Percentage of swift fox track sites with good to excellent tracking conditions	42%	34%	8%
Percentage of surveys conducted within 1 to 3 days following a rain event	74%	51%	5%
Percentage of surveys conducted greater than 3 days following a rain event.	21%	42%	93%
Percentage of surveys conducted with winds 1 to 5 mph	68%	44%	53%
Percentage of surveys conducted with winds > 5 mph	32%	56%	47%

During all three survey periods, swift fox tracks were detected most often throughout the three panhandle counties on two-track and dirt roads in rangeland land use and land cover types (Table 3). Rangeland was also the most prevalent land use and cover type searched in townships where swift fox tracks were not observed (Table 3). Cropland, including CRP lands, composed 51.2% of the entire study area (Figure 2). Rangeland comprised 49.1% of the entire study area, with 83.5% of the rangeland existing as herbaceous rangeland, 0.0002% as shrub rangeland, and 16.4% as mixed rangeland (Figure 2). In the panhandle region, cropland comprised 49.9% of the area and rangeland 48.4%; with the rangeland existing as 92.2% herbaceous range, 0.0003% shrub range, and 7.7% mixed rangeland (Figure 2). The rangeland plant community consisted primarily of blue grama (*Bouteloua gracilis*)-buffalograss (*Buchloe dactyloides*), interspersed with sandsage (*Artemisia filifolia*). The mixed rangeland also consisted predominately of blue grama and buffalograss, along with sandsage, yucca (*Yucca glauca*), and cholla cactus (*Opuntia imbricaria*). In the extreme eastern edge of the study area, eastern red cedar (*Juniperus virginiana*) encroachment was evident in the mixed range land use and cover category.

Table 3. Land use and land cover types with and without swift fox tracks in the panhandle counties (Cimarron, Texas and Beaver) 1998 - 2000.

Land Use and Cover Type	1998*		1999		2000	
	with tracks	no tracks	with tracks	no tracks	with tracks	no tracks
Range	59%	41%	68%	46%	74%	48%
CRP	14%	19%	7%	19%	14%	19%
Fallow	10%	14%	9%	13%	7%	14%
Other Crop	10%	14%	5%	8%	0	6%
Winter Wheat	2%	3%	9%	7%	2%	4%
Irrigated Crop	2%	7%	2%	5%	0	5%
Mesa	2%	3%	0%	1%	2%	4%

\*only Cimarron and Texas counties included

Other furbearers detected with the survey during 1999 and 2000 included, coyote (*Canis latrans*) 87% of the townships in both 1999 and 2000; badger (*Taxidea taxus*) in 37% of the townships in 1999 and 34% in 2000; raccoon (*Procyon lotor*) in 34% of townships in 1999 and 14% in 2000; striped skunk (*Mephitis mephitis*) in 34% of 1999 townships and 29% in 2000; bobcat (*Lynx rufus*) in 18% of townships in 1999 and 9% in 2000; domestic dog (*C.familiaris*) in 16% of townships in 1999 and 10% in 2000; and domestic cat (*Felis catus*) in 5% of 1999 townships and 3% in 2000. Tracks of black-tailed jackrabbits (*Lepus californicus*) were observed in 44 % of townships in 1999 and 2000. Eastern cottontail rabbits (*Sylvilagus floridanus*) were observed in 37% and 47% of townships in 1999 and 2000. Black-tailed prairie dogs (*Cynomys ludovicianus*) were seen in 9% and 18% of townships during 1999 and 2000 while surveying tracks. Information concerning jackrabbits, cottontails and prairie dogs, however, was only noted casually, and not specifically requested.

## DISCUSSION

Results from track search surveys conducted for swift fox in Oklahoma confirm those from Kansas (Roy et al. 1997), indicating this method has been an effective technique for conducting landscape-scale presence/absence surveys for swift fox. Because track searches were restricted to habitat believed most suitable for swift fox and most favorable for finding tracks, costs were controlled and high detection rates were achieved. Data quality was enhanced by using experienced ODWC employees as trackers. The use of county game wardens to conduct the survey aided tremendously in the ability to access private rangeland throughout the study area.

Swift fox tracks were not observed using this survey outside the Panhandle region during 1999 or 2000. Tracks were observed in one township in Harper County in 1999, but the two-hour time limit for the

track search survey had already elapsed. A road kill swift fox was also recorded from Ellis County during the spring of 1999, prior to the when track search survey was conducted. Although this information indicates the presence of swift fox in the main body of the state, the extent to which the species occurs in the far eastern reaches of the shortgrass High Plains ecoregion or beyond this ecoregion is unknown.

Swift fox tracks were encountered more often in herbaceous rangeland land use and land cover type. But, herbaceous rangeland was the land use and cover type searched whenever it was available within a survey township. Swift fox tracks were observed in agricultural areas throughout the study area, but agricultural areas were not searched in proportion to their availability. If cropland and rangeland were both present in a township, only the rangeland was most likely surveyed. The proportion of rangeland existing as herbaceous rangeland in Panhandle was 92.2% while shrub and mixed range comprised only 7.7%. Outside the Panhandle, the percentage of the existing rangeland that occurred as herbaceous range dropped to 57.0%, while the mixed herbaceous/shrub range increased to 42.9%. Because of the increasing vegetation density and height in the mixed herbaceous/shrub range, this land use and cover type is not considered suitable for swift fox when compared to the relatively shorter, herbaceous rangeland vegetation that occurs in the shortgrass High Plains ecoregion.

In general, the terrain in the Panhandle portion of the study area was flatter than that of the main body of the state (Figure 3). From west to east across the study area, a greater proportion of the available herbaceous range occurred in more rugged terrain where land conversion to cropland was not convenient. On the flatter terrain in the Panhandle portion of the study area, winter wheat was the predominant land use, while in the main body of the state, a greater proportion of the flatter terrain occurred as mixed range rather than as winter wheat. Thus, the amount of optimal swift fox habitat decreases from west to east through the shortgrass High Plains ecoregion within in Oklahoma.

The swift fox track detection rate decreased from 1998 to 2000 in the two counties for which data were available for all years (Cimarron and Texas counties). During the 1998 tracking season, this region received above normal rainfall, allowing 74% of the tracking surveys to be conducted within three days following a rainfall event. In contrast, only 51% of the track search surveys conducted during 1999 were done within three days after a rainfall. And in 2000, only 5% of the track search surveys were conducted within three days after a rainfall. Conducting track searches following rainfall events resulted in better tracking conditions, and thus more swift fox tracks being observed within these counties during 1998 than in 1999 or 2000. The tracking substrate in Texas County was particularly affected by precipitation patterns, and track detection rates dropped from 57% in 1998 to 37% in 1999 to 27% in 2000.

Data from all three survey-years have supplemented previous information on the distribution of swift fox in Oklahoma. Information has been made available to all members of the Swift Fox Conservation Team and included in the Team's 1998 and 1999 annual reports to the USFWS. Results have also been provided to the Northern Prairie Wildlife Research Center for use in swift fox population model database. By combining data from all states where track search surveys have been used, it has been determined that this technique can detect changes in swift fox abundance among years by monitoring every third township every third year (Marsha Sovada pers. comm.).

## LITERATURE CITED

- Caire, W., J. D. Tyler, B. P. Glass, and M. A. Mares. 1989. Mammals of Oklahoma. University of Oklahoma Press, Norman, OK. 567 pp.
- Cutter, W. J. 1959. Notes on some mammals from north Texas. *Southwestern Nat.* 4:30-34.
- Duck, L. G. and J. B. Fletcher. 1945. A survey of the game and furbearing animals of Oklahoma. Div. Wildl. Restor. and Res., Oklahoma Game and Fish Comm., Pitman-Robertson Ser. No. 2, State Bull. No. 3. Oklahoma City.
- Glass, B. P. 1959. Status of the kit fox, *Vulpes velox*, in the High Plains. *Proc. Oklahoma Acad. Sci.* 37:162-163.
- Hoagland, J. W. 1996. Oklahoma swift fox status report - 1996. Pages 30-49 in Luce, B. and F. Lindzey (eds.) Annual Report of the Swift Fox Conservation Team. 110 pp.
- Kilgore, D. L., Jr. 1969. An ecological study of the swift fox (*Vulpes velox*) in the Oklahoma Panhandle. *Amer. Midl. Nat.* 81:512-534.
- Roy, C. C., M. A. Sovada, and G. A. Sargeant. 1997. Swift fox (*Vulpes velox*) management and research in Kansas: 1997 annual report. Pages 88-93 in Giddings, B. (ed.). Swift Fox Conservation Team Annual Report. Proc. Annual Swift Fox Conservation Team Meeting. 125 pp.
- USGS 1990. Land Use and Land cover digital data from 1:250,000 and 1:100,000 scale maps. National Mapping program, Technical Instructions Data Users Guide 4.

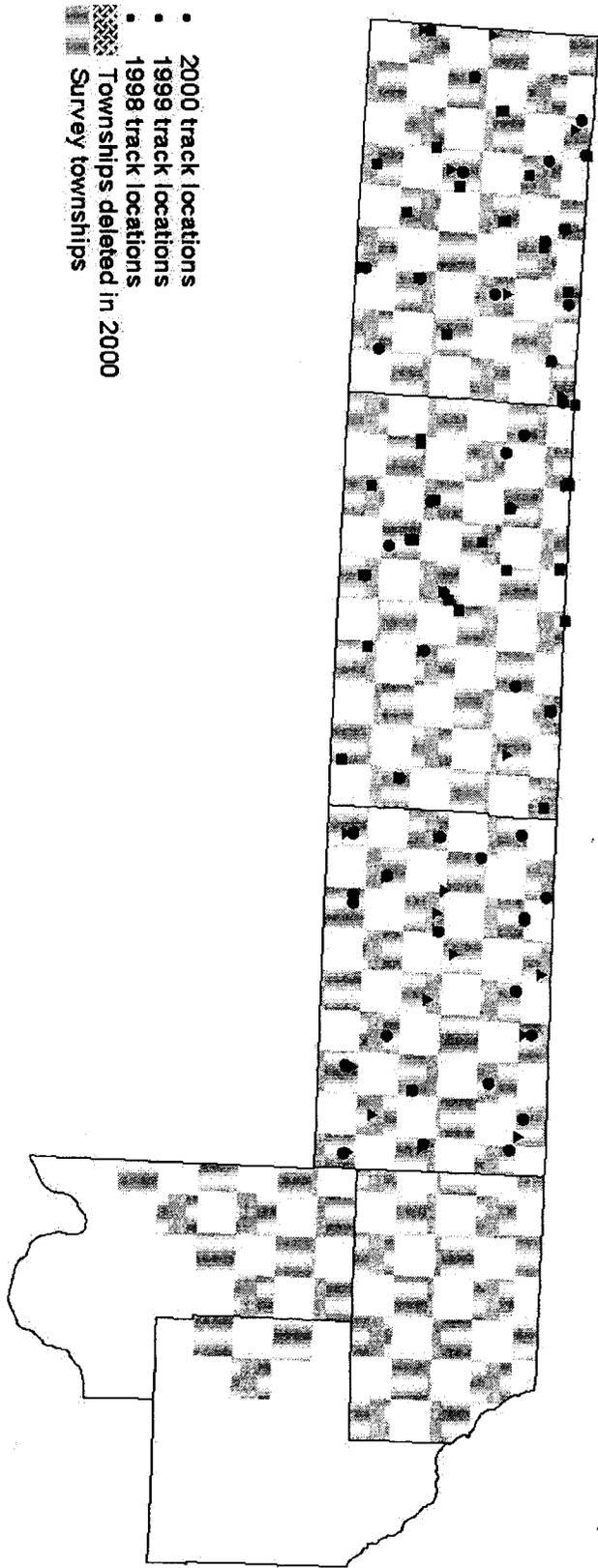
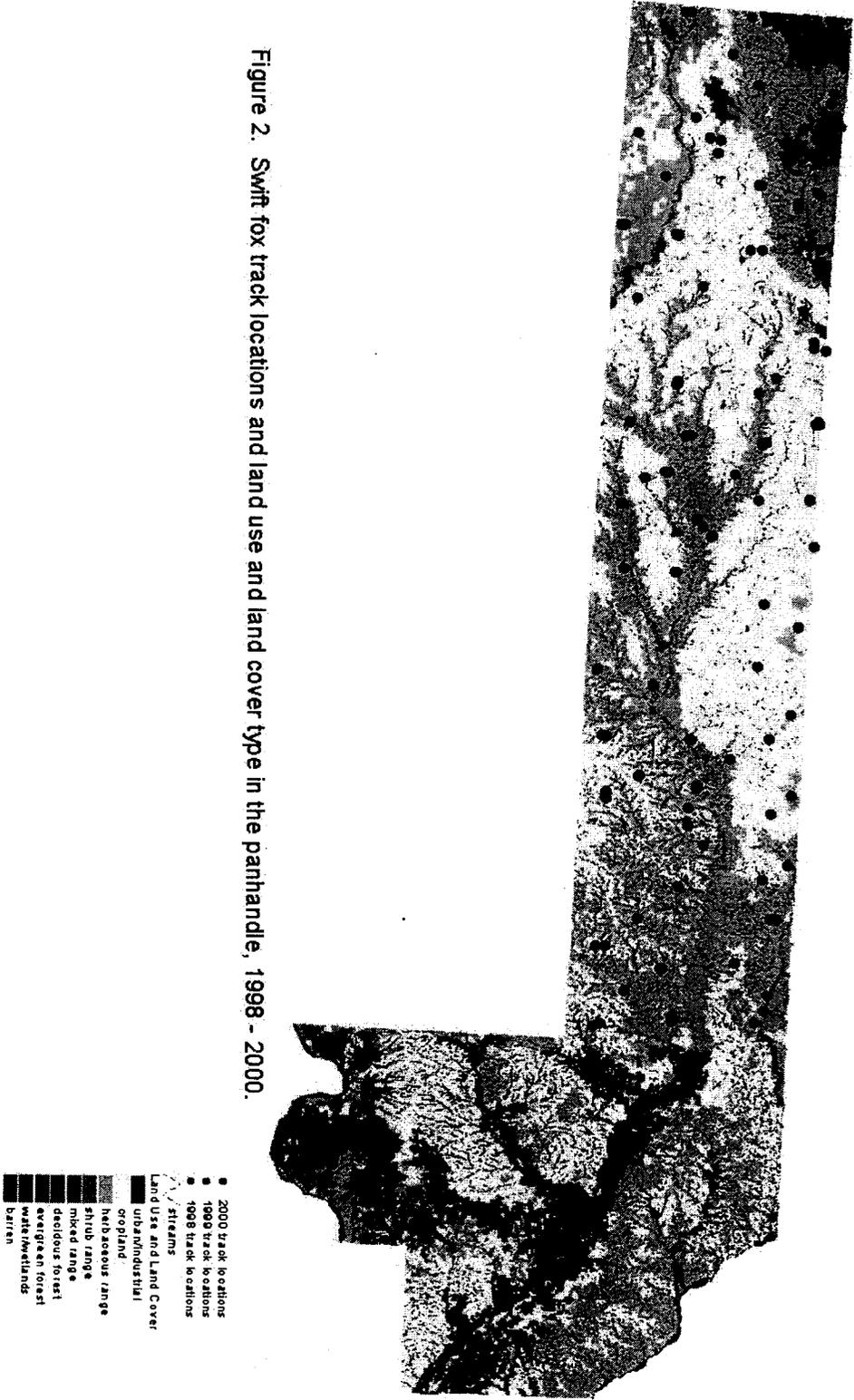


Figure 1. Swift fox track detection sites, 1998 - 2000 (only Cimarron and Texas counties were surveyed in 1998).

Figure 2. Swift fox track locations and land use and land cover type in the panhandle, 1998 - 2000.



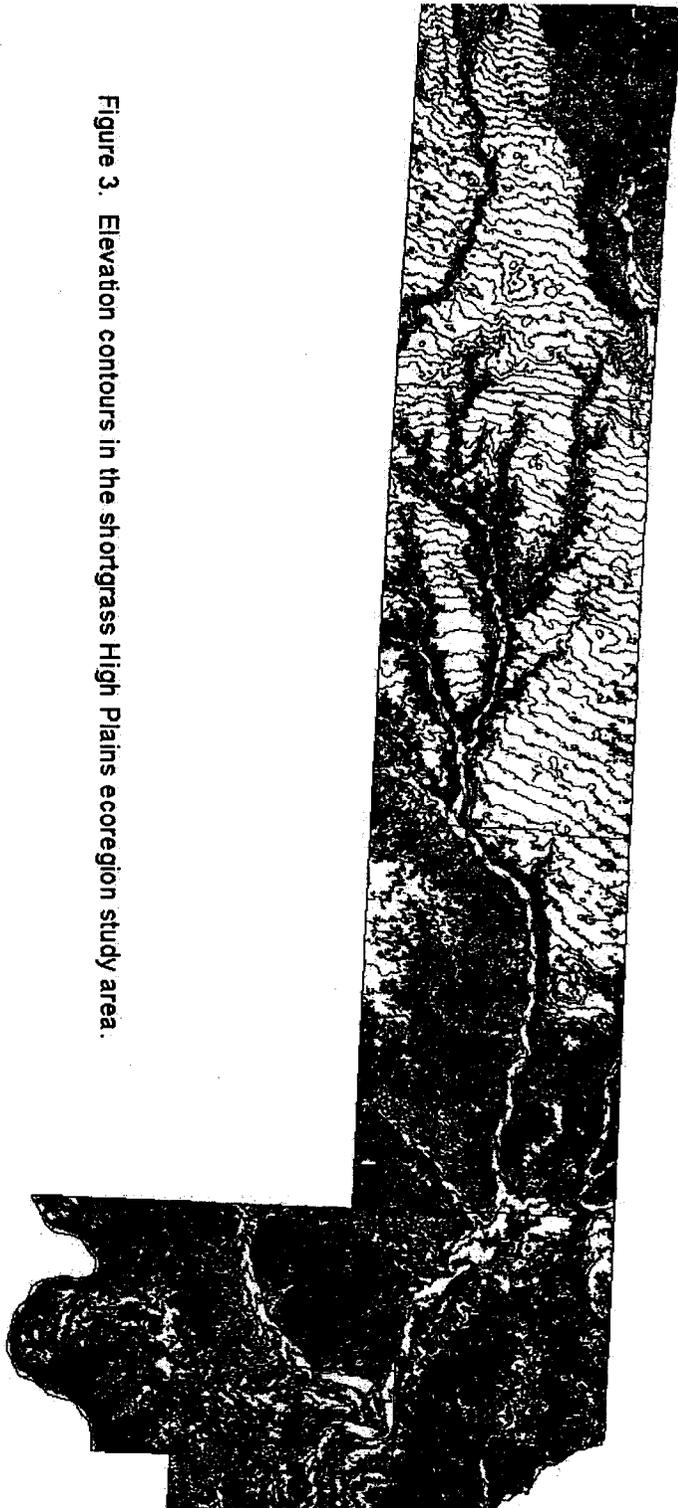


Figure 3. Elevation contours in the shortgrass High Plains ecoregion study area.

## ANNUAL REPORT: STATUS OF SWIFT FOX IN TEXAS

Dr. Robert M. Sullivan, Wildlife Diversity Ecologist, Texas Parks and Wildlife, Region 1 (District 2), P 2), P.O. Box 659 Canyon, TX 79015

### **Current Position of Texas Parks & Wildlife Regarding Swift Fox Conservation**

#### USFWS DECIDES NOT TO LIST SWIFT FOX AS THREATENED

##### *Research, Landowner Grants Helping Fox In Texas Panhandle*

AMARILLO, Texas - The swift fox will no longer be a candidate for federal threatened or endangered species status, thanks in part to the work of a multi-state team of biologists and landowners, including private land conservation efforts in Texas. The U.S. Fish and Wildlife Service has decided to remove the swift fox from the list of candidates that could be listed under the federal Endangered Species Act. After years of study by state and federal biologists and universities, the USFWS has concluded that although swift fox numbers have declined, viable populations occur on about 40 percent of the animal's historic range. Research has also shown the swift fox can adapt to a wider range of habitat types than previously believed and is more tolerant of modified land uses.

"I commend the efforts led by the states to address the status of the swift fox," said Ralph Morgenweck, director of the USFWS mountain-prairie region. "Neither the Service nor the states want to see species placed on the endangered list, as each new listing represents a wildlife conservation failure. The challenge now is to continue working together, get ahead of the curve, identify species in trouble, to put ecosystems in working order before the situation leads to an endangered species listing."

Scientists and others involved with the Swift Fox Conservation Committee intend to continue prairie conservation efforts that will benefit the swift fox. For the past six years, this team has worked within the swift fox's historic range in 10 U.S. states and the Canadian province of Alberta. Similar interstate groups are focused on the lesser prairie chicken and black-tailed prairie dog, two other species of concern that are native to the shortgrass prairie. The goal for these conservation efforts is to protect what remains of the vast prairies that once covered central North America and to restore prairie habitat whenever possible, as this helps not only rare species but large numbers of other wildlife.

"We are bound by agreement of the Swift Fox Conservation Committee to keep working to conserve the species," said Dr. Robert Sullivan, TPW biologist in Canyon. "If we don't, we'll eventually be right back to square one. We have to follow through on the plan, and we're really only half way there. This effort will make sure the species isn't jeopardized in the future."

Since 1997, Texas Parks and Wildlife, the USFWS and private landowners have contributed more than \$140,000 for seven Panhandle region projects to conserve native wildlife and habitat. Landowners ante up cash and in-kind contributions to fund a percentage of the projects and in return receive larger sums as grants. Through the TPW Landowner Incentive Program (LIP) and the USFWS Partners for Wildlife Program, the grants encourage ranchers to undertake native prairie and wetlands restoration such as

rotational and cellular cattle grazing regimes, research and monitoring and other action on their land to aid the swift fox, lesser prairie chicken, black-tailed prairie dog, and other shortgrass prairie wildlife. To receive LIP grants, landowners voluntarily sign contracts in which they commit to take specific conservation actions on their property.

“Rare species and habitat conservation in Texas can only succeed with cooperation from private landowners because 97 percent of our state is privately owned,” said Andrew Sansom, TPW executive director. “The rural landowners of Texas have the habitat, and most of them are good stewards of natural resources. Our job is to assist with practical and financially viable options for them to conserve resources in their care.

At the Arrington Ranch in Hemphill County, Mike Arrington and his father George are working to enhance about 1,200 acres of prairie on their 5,400-acre ranch. Their \$57,807 conservation project is funded mainly by TPW and USFWS, but the Arringtons are also putting in several thousand dollars worth of cash and labor. They are restoring and enhancing upland prairie springs and riparian (wet) zones such as cottonwood bottoms along the Washita River. They are also removing undesirable exotic plant species such as salt cedar and Russian olive from river bottomlands. The main family businesses are cattle and oil and gas, but they have a significant nature tourism operation involving hunting and birdwatching. As an interesting aside, actor Tom Hanks was at the ranch in March and May 2000 during filming of inland scenes for the movie *Castaway*. By restoring native prairie, they are helping many species, including the swift fox.

“We’re trying to increase our wildlife,” said Mike Arrington, whose family has owned the land for five generations. “Our prairie chicken numbers are not as high as in the past. I talked to Texas Parks and Wildlife and they said if we added some additional water and cross fencing and rotated our cattle, we could add nesting area for the prairie chicken and increase bird numbers. We think there are people who would want to come stay in our bed and breakfast and see the birds do their mating dance. So we’re doing it for tourism, and also because we want the native animals that are here to remain here.”

At the Shaller Ranch in Donley County, Ted Shaller is doing similar prairie restoration work on about 3,000 acres, distributing water and rotating cattle grazing in ways that improve his cattle operation efficiency and help the lesser prairie chicken and its prairie habitat. By continuously moving cattle around to allow sections of ranch grass to rest and recover, the native grasses grow better for cattle, better retain rainwater and provide taller cover for prairie chickens.

For information on landowner assistance in the Texas Panhandle contact: Dr. Robert M. Sullivan, Landowner Incentive Coordinator for the High Plains and Northern Rolling Plains, Texas Parks & Wildlife, Region 1 (District 2), Canyon, TX at 806-655-3782. For technical guidance and other wildlife programs, landowners anywhere in Texas may phone toll free to TPW in Austin at 800-791-1112.

### **Funded Research**

#### **EFFECTS OF COYOTES ON DISTRIBUTION, PRODUCTIVITY, AND SURVIVAL OF SWIFT FOXES IN THE TEXAS PANHANDLE**

JAN KAMLER and WARREN BALLARD, Texas Tech University, Department of Range, Wildlife, and Fisheries, KEVIN MOTE, Texas Parks and Wildlife Department, RICK GILLILAND, USDA-APHIS, Wildlife Services.

#### **BACKGROUND**

In 1996, TPWD conducted a systematic search of 25 counties in the Texas Panhandle to determine the current minimum distribution of swift fox in Texas. As a result of this effort, swift fox presence was detected in only two of the 25 counties (Dallam and Sherman counties). A program was initiated in 1997 to monitor population trends at each site annually. Spotlight surveys, along with live trapping and ear-tagging were employed. A cooperative research project was initiated in 1998. Field work (capture and radio-collaring of swift fox) began in mid August of that year. Although Section 6 funding for a segment of this project did not begin until September of 1999, population monitoring data collected from 1996 through 1999 are included in this report in order to provide relevant baseline information.

#### **RESULTS**

1996 – Spotlight and live-trapping surveys were conducted on the Rita Blanca National Grasslands in Dallam county and on a 3,633 hectare private ranch in Sherman county to determine presence/absence only. At the Dallam site a 47 km spotlight route was surveyed for 2 nights, resulting in 1 swift fox observation. A total of 35 trap-nights resulted in the capture, mark, and release of 3 swift fox. This documented the first confirmed report of swift fox in Texas in 10 years. Live-trap survey of the Sherman site totaling 6 trap-nights produced 1 swift fox capture and release. Spotlight surveys were not conducted on the Sherman site in 1996 due to documented swift presence from live-trapping. 1997 – The first year of an annual monitoring program was established at both occupied sites from 1996. Spotlight surveys on the Dallam site resulted in 6 swift observations along the 47 km route, during the 2 night period. No swifts were captured during 24 trap-nights of effort (12 traps for 2 nights). At the Sherman site, 8 swifts were observed along a 24 km route, conducted for 2 nights. Five swifts were captured during 20 trap-nights of effort (10 traps for 2 nights). 1998 – In August of 1998 a research project was initiated to evaluate the effects of coyotes on swift fox as well as to begin describing the home range habitat characteristics of swifts in Texas. Two 94 km<sup>2</sup> study sites were established. Both study sites were centered upon each of the Dallam and Sherman sites. The Dallam site is centered on a portion of the Rita Blanca National Grassland and as is comprised of open, native, short grass prairie rangeland. The

Sherman site is comprised of interspersed rangeland, cultivated fields, and mid/tall grass-dominated Conservation Reserve Program acreage on privately owned lands. Annual monitoring of swift populations was incorporated into the study design and conducted at each site. Methods used to conduct annual monitoring and research at both sites included spotlight surveys and prolonged saturation trapping using live-traps. Population monitoring of the Sherman site consisted of a 24 km spotlight route conducted during 2 consecutive nights, and a total of 422 trap nights over a 4 1/2 month period from Aug.15 to Dec. 31. During this period, 10 swifts were observed during spotlight surveys. This represented an average of 1 fox/4.8 km which was similar to 1997 results of 1 fox/6 km. Twelve swifts were captured (11 radio-collared) from 43 total captures. At the Dallam site, a 25.8 km spotlight route conducted on 2 consecutive nights produced only 2 swift observations showing a decline from 1 fox/15.7 km in 1997 to 1 fox/25.8 km in 1998. A total of 275 trap-nights resulted in capturing and radio-collaring 15 swifts that were captured a total of 24 times. Trapping for swifts at both sites was not conducted between May 1 and August 15 to prevent capture of pregnant or nursing females. 1999 – Spotlight surveys were conducted along the same routes as 1998 and run for 3 consecutive nights during winter, spring, summer, and fall. Both swifts and coyote observations were recorded. Spotlight survey results are provided in Table 1.

Table 1. – Results of spotlight surveys conducted in 1999.				
Season	Sherman Site		Dallam Site	
	Swift <sup>1</sup>	Coyote	Swift	Coyote
Winter	6.3	0	13	32.5
Spring	4.5	12.6	10.8	8.1
Summer	7	12.6	9.3	32.5
Fall	10.5	21	13	65

<sup>1</sup>Expressed as kilometers of spotlight route per animal.

## DESCRIPTION OF PROGRESS

*Year 1 (August 1998 - 1 September 1999)* – Research activities were conducted at two locations in the Texas Panhandle. The Sherman site is located on private land in Sherman county. The Dallam site is located on and adjacent to the Rita Blanca National Grassland in Dallam county. Activities completed during this period were prior to initiation of Section 6 funding. Trapping and radio collaring of swift fox and coyotes were conducted at both sites. At the Sherman site a total of 18 swift foxes were radio collared from 56 total captures in 504 trapnights. Twelve coyotes were captured and radio-collared from a total of 360 trapnights. Swift fox trapping at the Dallam site resulted in 18 swifts radio-collared from a total catch of 37 in 413 trapnights. Twelve coyotes were radio-collared from a total of 360 trapnights. Location of radio-collared animals were conducted at both sites during this period. Locations of transmitters were obtained 3 times per 2 weeks. Work began to collect data for GIS base map for each study site. No significant deviations were required.

*Year 2 (1 September 1999 – 30 September 2000)* – Trapping for swift fox on the Sherman and Dallam sites produced a total of 22 new foxes from 613 trapnights and 27 new foxes from 848 trapnights,

respectively. At the Sherman site 5 new coyotes were radio-collared from 202 trapnights, while no trapping effort for coyotes was made at the Dallam site during this period. Monitoring of radio transmitters continued for both animals at both sites. The first 3 of 4 coyote control periods were completed by aerial gunning coyotes at the Dallam site. The first control period was conducted for 2 days in January 2000 when 53 coyotes were removed from the study area. The second control period occurred in April when 54 coyotes were removed, and the last occurred in August when only 13 coyotes were located and removed. Aerial gunning was conducted on the original 94 km<sup>2</sup> study area as well as a 3 km buffer around the area totaling 260 km<sup>2</sup> in which coyotes were controlled. Work on land use characteristics (rangeland, cropland, CRP) and animal home range GIS data layers continues but have not been completed. No significant deviations were required.

#### SUMMARY OF WORK COMPLETED

Preliminary results from radio telemetry data, covering the period between September 1998 and January 1, 2000, shows that swift fox on the Sherman site had an average home range size of  $10.2 \pm 1.1$  km<sup>2</sup> (mean  $\pm$  SE). Coyotes on the Sherman site had an average home range size of  $8.9 \pm 1.2$  km<sup>2</sup>. On the Dallam site Swifts had an average home range of  $7.6 \pm 0.9$  km<sup>2</sup>, while coyotes exhibited an average home range of  $18.7 \pm 1.0$  km<sup>2</sup>. Annual survival rates on the Sherman site was 70% for swift fox and 51% for coyotes. On the Dallam site, annual survival rate was 48% for swift fox and 74% for coyotes. In 1998-1999 there were 18 confirmed swift fox mortalities (11 from coyote predation, 4 from vehicle collision, and 3 undetermined). Most coyote predation (8 of 11) occurred at the Dallam site, whereas all vehicle mortalities occurred at the Sherman site. There were 7 confirmed coyote mortalities during the 1998-1999 period, and all were caused by human hunters. Preliminary results show that swift fox had higher survival rates and greater numbers of dispersing juveniles on the Sherman site where there were lower densities of coyotes.

Costs Incurred During FY2000 – Costs incurred during the course of the FY2000 study are provided in Table 2.

Table 2. – Costs incurred during the course of the FY 2000 study.	
Description	Cost
Telemetry equipment	\$4,000
Vehicle fuel & Maintenance	\$6,000
Ph.D. student Stipend	\$12,000
Faculty Summer Salary (2 months)	\$10,000
TPWD Personnel (2 wks)	\$5,000
Aerial coyote control (Section 6 Federal dollars)	\$6,000
Total	\$43,000

## SWIFT FOX AND COYOTE INTERACTIONS IN THE SHORT-GRASS PRAIRIE OF NORTHWEST TEXAS: POPULATION VIABILITY, DEN SITE ECOLOGY, AND DIET OVERLAP

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### PURPOSE AND NEED

Once abundant throughout short-grass and mid-grass prairies of North America, numbers of swift fox (*Vulpes velox*) have declined rapidly with expansion of human settlement. By 1900, swift fox were extirpated from most of its historical range. Over the last half-century, however, populations have begun to recover, largely as a result of reduced poisoning and trapping. In 1992, the U.S. Fish and Wildlife Service (USFWS) was petitioned to list the swift fox as *Threatened* under the Federal Endangered Species Act (ESA). In June of 1995, the USFWS 12-month Finding concluded that listing was warranted but precluded. In December of 1994, the Swift Fox Conservation Team (SFCT) was formed as a proactive alternative to listing under ESA. Since 1994, SFCT state representatives have met annually to report on research and management activities conducted in their respective states. These activities have generally followed goals and objectives presented in the *Conservation Assessment and Conservation Strategy*, yet virtually no information is currently available on estimates of minimum viable population (MVP) size for swift fox.

As such, a major priority of the SFCT is to obtain estimates of the MVP<sup>1</sup> size of swift fox populations in each state throughout the species historic range. Because swift fox use dens year-round for shelter, protection from predators, and sites to rear young, it is the most den-dependent and subterranean North American fox. This life-history strategy provides an unique opportunity to assess minimum viable population size through monitoring populations at natal den sites. Data derived from our study, in conjunction with research currently being conducted on distribution, productivity, and survival of swift foxes, will provide the necessary information to begin to assess MVP size in swift fox in the Texas Panhandle. The USFWS's Ecological Service's office has initiated the process of removing swift fox from the warranted but precluded list; however, without continued research from states across the range of the species this goal of removal will not be met.

### OBJECTIVES:

- Estimate MVP size by use of radio collaring and behavioral monitoring of foxes at natal den sites.

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<sup>1</sup> Smallest isolated population size that has a specified percent chance of remaining extant for a specified period of time in the face of foreseeable demographic, genetic, and environmental stochasticities, plus natural catastrophes.

- Monitor use, occupation, and emergence of swift fox at natal dens.
- Determine pup-rearing success and litter size.
- Determine the contribution helpers make to pup-rearing.
- Determine frequency of occurrence of helpers on/off "coyote control" sites.
- Determine diets between foxes and coyotes, among years, among seasons, and on/off coyote control sites.
- Develop comprehensive guidelines for conservation and management of swift fox in the Texas Panhandle, including a: (1) review of all pertinent literature summarizing/tabularizing information on life-history strategies, ecology, habitat management, conservation efforts, and (2) specific set of long-term management recommendations.

#### EXPECTED RESULTS, BENEFITS, AND POTENTIAL FOR FUTURE RESEARCH

**Expected Results.** Kit fox are adversely impacted by predation from coyotes. Comprehensive knowledge of the potential impacts of coyotes on populations of swift fox in the Panhandle of Texas is required to formulate individual and ecosystem-level management plans for conservation. Additionally, recent evidence shows that in areas with reduced coyote numbers, swift fox social groups are different. Helpers that aid pup-rearing were only found in coyote control areas, suggesting that removal of coyotes may ease pressure on swift foxes social groups and increase pup-rearing success. Thus, coyotes adversely impact swift fox populations by indirectly reducing pup-rearing success as well as through direct mortality. Removal of coyotes may also affect food selection in swift foxes. If significant overlap is documented in swift fox and coyote feeding habits, a reduction of coyotes may increase access to food resources for swift fox. Coyotes also affect faunal composition of short-grass prairies communities. If numbers of small mammals increase, swift fox may have a more abundant and diverse food base to select from, thereby increasing survival and reproductive rates to sustain long-term viability of resident foxes.

**Benefits and Anticipated Publications.** Our study will provide guidelines for biologists and landowners interested in managing short-grass prairie landscapes and associated communities of grassland species in the Panhandle (Objective #3 above). Additionally, these data will assist in development of more refined habitat recommendations for swift fox, particularly as relates to more effective and efficient use of historical CRP lands. For example, a possible management scenario to facilitate continued range expansion of swift fox may be to suppress local populations of coyotes to increase survival and growth rates of swift fox populations in affected areas. Anticipated publications include:

- Overlap in food items in swift fox and coyote populations in northwest Texas.
- Diet of swift fox in northwest Texas.
- Parental roles in pup-rearing behavior of swift foxes in northwest Texas.
- Pre-emergent pup-rearing success of swift fox in northwest Texas.
- Use of a den probe and its impacts for looking in small canid dens.
- Comprehensive guidelines for conservation and management of swift fox in the Texas Panhandle

Potential for Future Research. In 1996, TPW in cooperation with TTU and USDA Wildlife Services initiated a comprehensive research effort to survey and monitor the distribution and dynamics of swift fox populations in selected regions of the Texas Panhandle. Data from spotlight surveys, live-trapping, radio telemetry, and GIS layering of land use characteristics (i.e, rangeland, cropland, CRP) onto individual home ranges were gathered and continue to be developed. This effort implements specific objectives to insure long-term viability of swift fox populations throughout its historic range in Texas. At present, we have implemented and are gathering data on six major goals (Table 1). Research proposed herein will contribute greatly to this effort. Several goals are yet to be implemented and additional supplementary information is need to strengthen various actions associated with each objective.

Table 1. – Major goals of SFCT as listed in the <i>Swift Fox Conservation Strategy</i> , schedule of action		
Goal	Description	Progress by TPW and Texas Tech University
1.	Establish a swift fox team	Implemented
2.	Determine Current Species Distribution	Implemented, in progress
3.	Monitor Swift Fox Population Status	Implemented, in progress
4.	Determine minimum viable population estimates to maintain genetic integrity	Proposed herein
5.	Identify existing native shortgrass/mid-grass prairie ecosystems and other suitable swift fox habitats	Implemented (part), proposed herein (part)
6.	Promote habitat conservation and management in occupied and suitable habitat	Proposed herein (part)
7.	Expand distribution of U.S. swift fox populations to potentially occupy 50% of the available suitable habitat	
8.	Integrate swift fox conservation strategy objectives with management and habitat objectives of other prairie ecosystem species	Implementation in progress, proposed herein (part); and coordinating working with Lesser Prairie-Chicken and black-tailed prairie dog working groups, Partners in Flight, and TPW Landowner Incentive Program
9.	Promote scientific swift fox management and a public education program	Proposed herein (part)
10.	Implement Research on Swift Fox Biology and Ecology	Implemented (part), in progress (part)
11.	Removal of the swift from the ESA Category I species list	

## CURRENT STATE LAWS AND REGULATIONS

**Legal Requirements for Swift Fox Import, Export, or Release.** New sections are adopted under Texas Parks and Wildlife Code, Chapter 71, provides the Texas Game Commission with authority to regulate the taking, possession, propagation, transportation, exportation, importation, and sale of all fur-bearing animals, including swift fox. In Texas “fur-bearing animals” include: badgers, beavers, fox, mink, muskrat, nutria, opossum, otter, raccoon, ring-tailed cat, skunk, and civet cat.

**Export Requirements** – Written authorization shall be obtained from the Texas Parks and Wildlife prior to sale or export of live fur-bearing animals to persons outside of Texas. Applicants shall provide written verification that recipients of live fur-bearing animals have complied with applicable regulations in the destination state. A copy of the import permit or export authorization must accompany any live fur-bearing animal being imported or exported. Each shipment must be accompanied by a health certificate signed by a veterinarian accredited in the state of origin and if the imported animals foxes a signed letter of authorization issued by the Texas Department of Health. Imported live fur-bearing animals and live fur-bearing animals previously held in captivity may not be released into the wild in this state.

**Import Requirements** – Importation of fur-bearing animals or their pelts into Texas from another country is prohibited without first completing the import documentation required by the United States Fish and Wildlife Service and U.S. Customs Service. No person may import live fur-bearing animals taken from the wild into Texas from another state or country without a permit. An importation permit will only be issued to licensed fur propagators. Texas Statute §65.378 “*Importation and Release of Fur-bearing Animals or Their Pelts*” states that:

(a) No person may import live fur-bearing mammals into this state from another state or country unless: (1) a permit has been issued by the department for such importation and a copy of the completed permit accompanies any live fur-bearing animal being imported or is attached to any container used to import live fur-bearing animals; (2) the imported animals are accompanied by a health certificate signed by a veterinarian accredited in the state of origin; and (3) if the imported animals are foxes, raccoons, or skunks, a signed letter of authorization issued by the Texas Department of Health.

(b) Imported live fur-bearing animals, live fur-bearing animals previously held in captivity, and fur-bearing animals live-trapped as nuisances may not be released into the wild without a letter of authorization from the wildlife division and the owner of the property where the release occurs. Animals released under provision of this subsection must be accounted for in a report filed with the department on or before the tenth day of the month following the month of release. The report shall list the species, number captured and released, date and location of capture, date and location of release, and name and address of person authorized to release.

**Release Requirements** – See part (b) under Import Requirements

**Time to Obtain Permits** – None

Additional Permits Needed – See Parts (a) and (b) under Import Requirements; also, for the newest information on laws regulating taking of fur-bearers, and import and export permits in the Panhandle contact : Trent Anderson (Captain), Law Enforcement Division, 203 West 8th Street, Suite 200, Amarillo TX, 79101, phone: 806-379-8900

Additional Comments or Concerns:

*Reporting Requirements Are Covered by Texas Statute §65.379:* (a) Any person licensed as a retail fur buyer or wholesale fur dealer must complete and file an appropriate annual report with the department by May 31 of each year. (b) Any person licensed as a fur-bearing animal propagator must complete and file an appropriate annual report with the department by August 31 of each year. © The department reserves the right to refuse permit issuance to any person not in compliance with this section.

*Possession of live fur-bearing animals is covered by Texas statute §65.376:* (a) No person other than the holder of a fur-bearing animal propagation license may possess a live fur-bearing animal at any time, except as otherwise provided in this chapter. (b) A propagation license may be issued following an initial facility inspection by the department. Additional inspections may be made at department discretion. For persons not engaged in selling or trading fur-bearing animals, there is no initial facility inspection; however, inspections may be performed at the discretion of the department. © The holder of a fur-bearing animal propagation license shall provide the following for each animal in possession: (1) a sufficient supply of fresh water at all times; (2) shelter from heat and inclement weather; and (3) an enclosure of at least 20 inches in height and eight square feet in area. Enclosures shall be cleaned daily; (d) offspring of fur-bearing animals held under a propagation permit may be kept with their parents or siblings for up to 120 days from birth in an enclosure meeting the height and area requirements for a single animal. (e) Nothing in this sub-chapter shall prohibit a taxidermist from possessing for taxidermy purposes a fur-bearing animal or the pelt of a fur-bearing animal lawfully taken or possessed under this sub-chapter, provided the animal or pelt is accompanied by a wildlife resource document as prescribed by Sub-chapter A of this chapter. (f) Live fur-bearing animals may be taken and possessed for three days or less for instructional or demonstration purposes pursuant to a letter of authorization from the Wildlife Division.

*Sale or purchase of fur-bearing animals or their pelts are covered by Texas Statute §65.377:* (a) No person other than licensed trappers, retail fur buyers, wholesale fur dealers, or fur-bearing animal propagators may sell fur-bearing animals or the pelts of fur-bearing animals, and no person other than licensed retail fur buyers, wholesale fur dealers or fur-bearing animal propagators may purchase fur-bearing animals or their pelts. (b) Live fur-bearing animals may be sold only: (1) by persons who hold a valid fur-bearing animal propagation license; or (2) to persons authorized by permits issued under Parks

and Wildlife Code, Chapter 43, Sub-chapter C, or another licensed fur-bearing animal propagator. © No person shall sell or export live fur-bearing animals outside this state without possessing a letter of authorization from the wildlife division. A request for authorization shall include written documentation verifying that the recipient of the live animals is in compliance with applicable regulations in the destination state. A copy of the completed authorization shall accompany the animals at all times during shipment or be attached to the shipping container used to export the animals. Persons violating laws involving fish and wildlife may be fined; charged restitution cost of illegally possessed fish and wildlife; and be subject to license suspension or revocation. Subsequent violations may result in jail terms. Each fur-bearing animal taken or possessed in violation of these general laws is a separate offense. The Texas Department of Health and local public health agencies may take and possess, for analysis and disposal, any fur-bearing animal posing a potential or known health hazard. Anyone may transport a suspected diseased fur-bearing animal to a public health facility for diagnosis.

Statewide Fur-Bearing Animal and Trapping Proclamation – The new sections are adopted under Parks and Wildlife Code, Chapter 71, which provides the Commission with authority to regulate the taking, possession, propagation, transportation, exportation, importation, and sale of fur-bearing animals.

*§65-371. Application* – This sub-chapter applies to fur-bearing animals statewide, except as otherwise specifically provided for in Parks and Wildlife Code.

*§65.374. General Rules*

(a) No person may take fur-bearing animals on public roads and highways or their rights-of-way, or in the state-owned river beads in Uvalde, Zavala, and Dimmit counties.

(b) Each fur-bearer or pelt taken or possessed in violation of this sub-chapter shall constitute a separate offense.

© No person may possess a live skunk or civet cat without a letter of authorization from the wildlife division.

(d) No retail fur buyer may possess undried pelts during the period May 1 through October 31.

(e) No wholesale fur dealer/retail fur buyer may purchase pelts from a trapper from April 6 through October 31.

(f) Nuisance forbearing animals may be taken in any number by any means at any time.

§65.375. Open Seasons; Means and Methods.

*Recreational harvest*

(a) The open season for the recreational harvest of fur-bearing animals is September 1 of one year to August 31 of the following year.

(b) The daily bag limit is one fur-bearing animal and the possession limit is two fur-bearing animals. A fur-bearing animal that has been reduced to a finished product shall not be considered part of the possession limit.

© Fur-bearing animals, pelts, and carcasses possessed under this subsection shall not be sold.

*Commercial harvest.*

(a) Open season for the commercial harvest of fur-bearing animals is November 1 of one year through March 31 of the following year.

(b) There are no bag or possession limits.

© From April 6 through October 31 no licensed trapper may possess more than two undried pelts taken under a trapper's license.

*Means and methods.*

(a) Only the following means and methods are legal for taking fur-bearing animals: (1) firearms, (2) steel leghold and conibear-style traps, (3) falconry, (4) live or box trap (dogs), (5) snare, (6) lawful archery equipment, (7) electronic or hand-held calls, and (8) artificial light.

(b) Exceptions: No person may: (1) take fur-bearing animals with steel leghold or conibear-style traps, except during the open season for commercial harvest; (2) set steel leghold or conibear-style traps within 400 yards of any school; or (3) use smoke, explosives or chemical irritants of any kind to harry or flush fur-bearing animals.

© Special provisions: (1) Conibear-style traps with a diagonal opening' dimension greater than 10 inches shall not be set on land or in less than six-inches of water; (2) snares, steel leghold traps, conibear-style traps, and live or box traps shall be examined at least every 36 hrs, and (3) animals taken by means and methods listed in this section shall be removed upon discovery.

§65.376. Possession of Live Fur-bearing Animals.

No person other than the holder of a fur-bearing animal propagation license may possess a live fur-bearing animal at any time, except as otherwise provided in this chapter. A

propagation license may be issued following an initial facility inspection by the department. Additional inspections may be made at department discretion. For persons not engaged in selling or trading fur-bearing animals, there is no initial facility inspection; however, inspections may be performed at the discretion of the department.

The holder of a fur-bearing animal propagation license shall provide the following for each animal in possession: (a) a sufficient supply of fresh water at all times; (b) shelter from heat and inclement weather; (c) an enclosure of at least 20 inches in height and eight square feet in area; (d) enclosures shall be cleaned daily; (e) Offspring of fur-bearing animals held under a propagation permit may be kept with their parents or siblings for up to 120 days from birth in an enclosure meeting the height and area requirements for a single animal; (f) nothing in this sub-chapter shall prohibit a taxidermist from possessing for taxidermy purposes a fur-bearing animal or the pelt of a fur-bearing animal lawfully taken or possessed under this sub-chapter, provided the animal or pelt is accompanied by a wildlife resource document; (g) live fur-bearing animals may be taken and possessed for three days or less for instructional or demonstration purposes pursuant to a letter of authorization from Wildlife Division.

#### §65.377. Sale or Purchase of Fur-bearing Animals or Their Pelts

No person other than licensed trappers, retail fur buyers, wholesale fur dealers, or fur-bearing animal propagators may sell fur-bearing animals or the pelts of fur-bearing animals, and no person other than licensed retail fur buyers, wholesale fur dealers or fur-bearing animal propagators may purchase fur-bearing animals or their pelts.

Live fur-bearing animals may be sold only: (a) by persons who hold a valid fur-bearing animal propagation license; or (b) to persons authorized by permits issued under Parks and Wildlife Code, Chapter 43, Sub-chapter C, or another licensed fur-bearing animal propagator.

No person shall sell or export live fur-bearing animals outside this state without possessing a letter of authorization from the wildlife division. A request for authorization shall include written documentation validating that the recipient of the live animals is in compliance with applicable regulations in the destination state. A copy of the completed authorization shall accompany the animals at all times during shipment or be attached to the shipping container used to export the animals.

#### §65.378. Importation and Release of Fur-bearing Animals or Their Pelts.

No person may import live fur-bearing animals into this state from another state or country unless: (a) a permit has been issued by the department for such importation and a copy of the completed permit accompanies any live fur-bearing animal being imported or is attached to any container used to import live fur-bearing animals; (b) the imported animals are accompanied by a health certificate signed by a veterinarian accredited in the state of origin; and (c) if the imported animals are foxes, raccoons, or skunks, a signed

letter of authorization issued by the Texas Department of Health.

Imported live fur-bearing animals, live fur-bearing animals previously held in captivity, and fur-bearing animals live-trapped as nuisances may not be released into the wild without a letter of authorization from the wildlife division and the owner of the property where the release occurs. Animals released under provision of this subsection must be accounted for in a report filed with the department on or before the tenth day of the month following the month of release. The report shall list the species, number captured and released, date and location of capture, date and location of release, and name and address of person authorized to release.

#### §65.379. Reporting Requirements

Any person licensed as a retail fur buyer or wholesale fur dealer must complete and file an appropriate annual report with the department by May 31 of each year. Any person licensed as a fur-bearing animal propagator must complete and file an appropriate annual report with the department by August 31 of each year. The department reserves the right to refuse permit issuance to any person not in compliance with this section.

§65.380. Penalty – Penalties for a violation of this sub-chapter are prescribed by TPW Code, Chapter 71.

#### Regulations – 1999-2000 – This Digest Expires August 31, 2000 – definitions

*Fur-bearing animals* – Badgers, beavers, fox, mink, muskrat, nutria, opossum, otter, raccoon, ring-tailed cat, skunk, and civet cat. Coyotes and bobcats are not classed as fur-bearing animals and are not subject to these regulations.

*Carcases* – The body of a dead fur-bearing animal, with or without the hide attached.

*Commercial harvest* – Take of a fur-bearing animal under a trapping license during the season for commercial harvest.

*Depredation* – Loss of, or damage to, agricultural crops, livestock, poultry, wildlife, or personal property.

*Lawful archery equipment* – The longbow, recurved bow, and compound bow.

*Nuisance fur-bearing animal* – A fur-bearing animal that is depreciating or a threat to human health or safety.

*Recreational harvest* – Take of a fur-bearing animal under a hunting license or under a trapper's license outside of the season for commercial harvest.

*Sale* – Includes barter and other transfers of ownership for consideration.

*Take* – Act of snaring, trapping, shooting, killing, or capturing by any means and includes an attempt to take.

#### License

*Hunting* – Required to take fur-bearing animals or their pelts during the recreational

season. A person taking fur-bearers with a trapper's license is not required to possess a hunting license.

*Trapper* – Required to take fur-bearing animals or their pelts during the commercial harvest season for the purpose of sale. This license also allows a person to take fur-bearing animals for personal use, when taken outside of the commercial season. Resident \$15.00 and Non-resident \$250.00

*Retail fur buyer* – Entitles a person to purchase fur-bearing animals or their pelts from trappers only. Resident \$75.00 and Non-resident \$300.00

*Wholesale fur dealer* – Required of persons purchasing fur-bearing animals or pelts of fur-bearing animals from trappers, retail fur buyers, fur-bearing animal propagators, or another wholesale fur dealer. Resident \$150.00 and Non-resident \$500.00

*Fur-bearing animal propagation* – Entitles a person to take or possess a living fur-bearing animal and hold it for the purpose of propagation or sale. Facility inspection required prior to initial licensing for commercial activity (\$5.00). Note: Persons 17 years of age or older while hunting, fishing or trapping **MUST** have on their person a driver's license or personal identification certificate.

General Regulations – No person may take a fur-bearing animal on privately-owned land or body of water without the consent of the owner of the land or water or his agent. Taking of fur-bearing animals on statutory wildlife sanctuaries, public roads and highways or their rights-of-way, and in state-owned river-beds in Uvalde, Zavala and Dimmit counties is prohibited. Persons violating laws involving fish and wildlife may be fined; charged restitution cost of illegally possessed fish and wildlife; and be subject to license suspension or revocation. Subsequent violations may result in jail terms. Each fur-bearing animal taken or possessed in violation of these general laws is a separate offense. The Texas Department of Health and local public health agencies may take and possess, for analysis and disposal, any fur-bearing animal posing a potential or known health hazard. Anyone may transport a suspected diseased fur-bearing animal to a public health facility for diagnosis.

#### Seasons and Bag Limits

##### *Recreational harvest:*

- September 1-August 31
- Bag limit - 1 per day
- Possession limit - 2
- Fur-bearing animals taken as a result of recreational harvest may not be sold.

##### *Commercial Harvest:*

- Nutria: September 1-August 31
- All other fur-bearers: November 1-March 31
- No bag or possession limit.

Propagators – Possession of live fur-bearing animals at any time is restricted to licensed fur-bearing animal propagators or persons authorized under Parks and Wildlife Code, Chapter 43. Fur-bearing

animal propagators may take fur-bearing animals alive only during the commercial harvest season and live fur-bearing animals may be held only in facilities which meet required specifications. Details on propagator requirements are given in a separate leaflet available from the Fur-bearing Animal Program, 4200 Smith School Road, Austin, Texas 78744.

Possession – No person may possess the pelt or carcass of a fur-bearing animal at any time except as indicated below. For fur-bearing animals taken by a recreational hunter, only two pelts may be possessed. No more than two green pelts of furbearing animals, except nutria, may be possessed by a licensed trapper after April 5 of each year. A retail fur buyer may not possess pelts during the period May 1 through October 31. Nutria pelts may be possessed at any time. Pelts that have been reduced to a finished product shall not be considered part of the possession limit. Live fur-bearing animals may be taken and possessed for 3 days or less by representatives of recognized organizations for approved instruction or demonstration purposes at scheduled meetings provided prior written authorization has been obtained from the department. Taxidermists may possess a fur-bearing animal or the pelt of a fur-bearing animal that was lawfully taken or possessed provided the animal or pelt is labeled with a wildlife resource document.

Means and Methods – Fur-bearing animals may be legally taken with firearms; leghold, conibear style, live or box traps; dogs; snares; lawful archery equipment; electronic or hand-held calls; artificial light; or by falconry except as prohibited below.

Exceptions – It is illegal to: Shoot at, take or attempt to take any fur-bearing animal from a boat on public waters in Texas. Take fur-bearing animals by means of falconry without a valid falconry permit issued by the department. Take fur-bearing animals with a leghold or conibear style trap except during the season for commercial harvest. Take fur-bearing animals with a leghold or conibear style trap within 400 yards of any school. Use smoke, explosives, or chemical irritants of any kind to harry or flush fur-bearing animals. Take fur-bearing animals with conibear style traps with a diagonal opening greater than 10 inches set on land or in less than 6-inch deep water. Take fur-bearing animals with snare, leghold trap, conibear style trap, and live or box trap unless such devices are examined at least once every 36 hours and animals are removed upon discovery.

Sale or Purchase of Fur-Bearing Animals or Pelts:

(a) Fur-bearing animals and their pelts can only be sold by:

- (1) licensed trappers;
- (2) licensed retail buyers or wholesale dealers;
- (3) fur-bearing animal propagators.

(b) Fur-bearing animals and their pelts can only be purchased for resale by:

- (1) licensed retail buyers or wholesale dealers;
- (2) fur-bearing animal propagators.

Fur-bearing animals and their pelts may be purchased by consumers only for personal use (no resale). Trappers may sell fur-bearing animals or their pelts only from November 1 through April 5. Live fur-

bearing animals may be sold only by a licensed fur-bearing animal propagator, and only sold to persons authorized by permit issued by the department or to another licensed fur-bearing animal propagator. No person may purchase, possess after purchase, or transport for commercial purposes a pelt or carcass taken in this state unless the person has acquired and possesses a retail fur buyer's license or wholesale fur dealer's license. A report on a form provided by the department must be completed and filed with the department on or before May 31 by holders of retail fur buyer and wholesale fur dealer's licenses. Licensed fur-bearing animal propagators must file reports by August 31 of each year. Failure to meet these reporting requirements will prevent renewal of the fur buyer, dealer, or propagation license.

Nuisance Fur-Bearing Animals – Landowners or their agents may take nuisance fur-bearing animals in any number by any means at any time on that person's land without the need for a hunting or trapping license. However, fur-bearing animals or their pelts taken for these purposes may not be retained or possessed by anyone at any time except licensed trappers during the lawful open season and possession periods. Nuisance fur-bearing animals may be captured and relocated if the person has received authorization from the department and the owner of the property where the release will occur. A monthly report is required and must be submitted to the department on number and kind of fur-bearers captured, location of release site, name, and address of person authorized to release.

Importation, Exportation, and Release of Fur-bearing Animals or Their Pelts – Importation of fur-bearing animals or their pelts into Texas from another country is prohibited without first completing the import documentation required by the United States Fish and Wildlife Service and U.S. Customs Service. No person may import live fur-bearing animals taken from the wild into Texas from another state or country without a permit. An importation permit will only be issued to licensed fur propagators. Written authorization shall be obtained from the department prior to sale or export of live fur-bearing animals to persons outside of Texas. Applicants shall provide written verification that recipients of live fur-bearing animals have complied with applicable regulations in the destination state. A copy of the import permit or export authorization must accompany any live fur-bearing animal being imported or exported. Each shipment must be accompanied by a health certificate signed by a veterinarian accredited in the state of origin and if the imported animals are foxes, raccoons or skunks, a signed letter of authorization issued by the Texas Department of Health. Imported live fur-bearing animals and live fur-bearing animals previously held in captivity may not be released into the wild in this state.

Rabies Quarantine – It is a Class C misdemeanor to transport live foxes, coyotes and raccoons from, to, or within this state. For additional information, please contact the Zoonosis Control Division of the Texas Department of Health at (512) 458-7255. For other information concerning hunting and fishing regulations, parks, wildlife or other subjects related to Texas Parks and Wildlife, call our toll-free number: 1-800-792-1112 during regular business hours. At any time of the day, Texans may call toll-free 1-800-792-GAME to report a violation of the state's game and fish laws. A reward may be offered to eligible callers who provide information which leads to a conviction.

## SWIFT FOX STATUS ON NATIONAL PARK SERVICE LANDS, 2000

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Twenty-four National Park Service units are located within the historic range of the swift fox (*Vulpes velox*); however, many of the units are small and were established for conserving cultural resources (e.g., protect historic structures: see Table 1). Several other units consist of forested habitats or are otherwise unsuitable for swift fox. Of the 24 units, only 14 have the potential for the presence of swift fox; however, there are no recent records of swift fox at any of these units. At many of the units, if a swift fox did occur it would likely be a transitory occurrence, due to the small size of the parks. Of all the parks in the swift fox range, Badlands National Park (NP) appears to have the best potential for supporting a self-sustaining population.

The National Park Service is initiating a comprehensive biological inventory and long-term monitoring program. Species to be inventoried for, and the methods used, are being developed by the parks. The inventory phase should be conducted over the next several years. Within the next few years parks will transition from inventory to a long-term monitoring program. Networks of parks, loosely based on similar ecological characteristics, will share a permanent monitoring team comprised of biologists and other specialists. What to monitor for, and the methods used, will be developed over the next several years. It's possible that some networks will institute monitoring methods that could detect swift fox and other carnivores.

Badlands NP in southwest South Dakota is considering a swift fox reintroduction program. Based on extensive spotlight (647 hours) and snow-track surveys conducted for black-footed ferrets, extensive work monitoring prairie dogs, other fieldwork, and the lack of recent records in the area, it's unlikely that swift fox currently exist at the park or in the vicinity (the closest documented population is about 60 miles to the southwest on the Fall River Ranger District of the Buffalo Gap National Grasslands). However, swift fox have historically been recorded in the park and it's vicinity. Preliminary assessments suggest that the park, along with the adjoining Wall Ranger District of the Buffalo Gap National Grasslands, have potential habitat for reintroduction. The park currently has an active wildlife management program for bison (*Bison bison*), prairie dogs (*Cynomys ludovicianus*), ferrets (*Mustela nigripes*), and other species associated with the grassland ecosystem.

Badlands NP has coordinated with the Turner Endangered Species Fund and the Bad River Ranch (owned by R. E. Turner) on their proposed reintroduction of swift fox. It's anticipated that they will assist the ranch wherever possible, and learn from their reintroduction efforts. The establishment of a swift fox population at Badlands NP would be a significant step in connecting the proposed Bad River Ranch population with the extant Buffalo Gap National Grassland population near Ardmore, South Dakota.

The National Park Service has recently revised its Management Policies (National Park Service. 2001. Management Policies 2001. Washington D.C.). The policies state that the agency "will maintain as parts of the natural ecosystems of parks all native plants and animals" and "will strive to restore

extirpated native plant and animal species to parks (if) ... the population can be self-perpetuating.” The policies recognize that many parks are too small to support viable populations, so parks are encouraged to collaborate with neighboring landowners and other entities in conserving native species.

Table 1.

Park <sup>1</sup>	State	Gross Acres <sup>2</sup>	Suitable Habitat	Reintroduction Potential
Little Bighorn Battlefield NM	MT	765	Poor	
Bighorn Canyon NRA	MT	120,296	Fair	
Devils Tower NM	WY	1,346	No	
Fort Laramie NHS	WY	832	Poor	
Mount Rushmore NMEM	SD	1,278	No	
Jewel Cave NM	SD	1,273	No	
Wind Cave NP	SD	28,295	Poor	
Badlands NP	SD	242,755	Good	Yes
Minuteman Missile NHS	SD	t.b.d.	unknown	
Agate Fossil Beds NM	NE	3,055	Poor	
Homestead NM of America	NE	195	No	
Scotts Bluff NM	NE	3,003	No	
Bents Old Fort NHS	CO	798	Poor	
Capulin Volcano NM	NM	792	No	
Carlsbad Caverns NP <sup>3</sup>	NM	46,766	Poor	
Lake Meredith NRA	TX	44,977	Fair	
Alibates Flint Quarries NM	TX	1,370	Poor	
Washita Battlefield NHS	OK	315	Poor	
Tallgrass Prairie NPRES	KS	10,894	Poor	
Nicodemus NHS	KS	161	No	
Fort Union Trading Post NHS	ND	443	No	
Knife River Indian Villages NHS	ND	1,758	Poor	

Table 1. Continued.				
Park <sup>1</sup>	State	Gross Acres <sup>2</sup>	Suitable Habitat	Reintroduction Potential
Theodore Roosevelt NP	ND	70,446	Poor	

<sup>1</sup> NM= National Monument, NHS = National Historic Site, NMEM = National Memorial, NP = National Park, NRA = National Recreation Area, NPRES = National Preserve

<sup>2</sup> Some parks may include small amounts of non-federal land within their boundary; Tallgrass NPRES is all non-federal land.

<sup>3</sup> Reports of swift fox-like foxes at park may be kit fox.

## PAWNEE NATIONAL GRASSLANDS SWIFT FOX REPORT 2000

Personnel on the Pawnee National Grasslands ran three consecutive nights of swift fox spotlight surveys. At least six hours of survey time were spent for each night of Sept 11,12 & 13. Eighteen, 33, and 29 swift fox were sighted respectively. In the past the surveys were set up to canvas the Grassland for occurrence. Starting in the fall of 2000 fixed routes were established which will set a relative index for year-to-year comparisons.

Mark Ball

## FORT PIERRE NATIONAL GRASSLANDS (FPNG) REPORT 2000

No formal surveys were completed.

Not aware of any Swift fox on the Fort Pierre National Grasslands.

Ted Turner bought land to the west of the FPNG, the Bad River Ranch. The Turner Endangered Species Fund (TESF) has completed a swift fox re-introduction feasibility report and re-introduction plan. They are planning to translocate about 30 foxes per year for six years from Wyoming and Colorado to the Bad River Ranch area in South Dakota. Ft. Pierre National Grassland is planning on entering into a MOU with TESF to release some of the foxes on the grassland.

Glenn Moravek

## OGALALA NATIONAL GRASSLANDS REPORT 2000

No formal surveys were completed.

A male swift fox was killed on the road east of Agate Reservoir (Section 1, Township 34 N., Range 53 W.)

Jeff Abegglen

## THUNDER BASIN NATIONAL GRASSLANDS REPORT 2000

No formal surveys were completed.

It is assumed the Swift fox populations on the Thunder Basin National Grasslands are stable.

Tim Byer

CIMARRON NATIONAL GRASSLANDS REPORT 2000

No formal surveys were completed.

It is assumed the Swift fox populations on the Cimarron National Grasslands are stable.

Mike T. Nelson

COMANCHE NATIONAL GRASSLANDS REPORT 2000

No formal surveys were completed.

It is assumed the Swift fox populations on the Comanche National Grasslands are stable.

Dan Garcia

BUFFALO GAP NATIONAL GRASSLAND REPORT 2000

East ½ Wall Ranger District

No formal surveys were completed. Because Conata Basin is a Black-footed Ferret reintroduction site many hours of spotlighting is being done.

One swift fox sighting was recorded during Black-footed Ferret surveys – Pennington County.

9. April 17, 2000.

a. T. 3S. R.15E. SW1/4 of section 21.

WEST ½ FALL RIVER RANGER DISTRICT.

Formal surveys were conducted in summer of 2000. See attached report.

## 2000 SWIFT FOX SURVEY

FALL RIVER RANGER DISTRICT  
BUFFALO GAP NATIONAL GRASSLAND  
NEBRASKA NATIONAL FOREST

AUTHOR: LYNN ALLAN HETLET

### INTRODUCTION

Surveys to determine locations of swift fox (*Vulpes velox*) were conducted on the Fall River District of the Buffalo Gap National Grassland from 1989 through 1999. Additional new areas were surveyed in 2000, as well as the only annual route established in 1994 that still shows evidence of a swift fox population.

### SURVEY AREAS

The area of Fall River County previously unsurveyed for swift fox that was surveyed in 2000, coincides with a Breeding Bird Survey route, and surveyed 6,250 acres (Map 1). An additional 3,000 acres were surveyed by Fall River District seasonal employee, Andy Bohnenkamp, in a proposed land exchange area (Report on file in District Office).

### METHODS

Approximately 120 man-hours (including travel time) were spent establishing and utilizing bait stations. A bait station consists of a circular area 18 to 20 inches in diameter cleared of all vegetation. A mixture of fine masonry sand and vegetable oil is spread over the area and smoothed. The mixture consists of one cup of oil to one gallon of sand.

Approximately one-half ounce of jack mackerel is placed in the center of the station to serve as bait. Because of the swift fox's primarily nocturnal habits, the stations are baited during the early evening hours to decrease the time of drying and insure a high degree of scent dispersal.

This sand/oil mixture will hold a track impression quite well, and if insects such as grasshoppers and carrion beetles are not abundant enough to be disturbing the bait and sand, (through either digging or simply hopping through it), it is not necessary to check the sites early, but the slanting light of the early hours greatly facilitates in seeing details in the track.

Bait stations are placed approximately 1/4 mile apart, following ridge tops to give better scent dispersal on the evening down drafts.

## RESULTS AND DISCUSSION

The area newly surveyed in the Indian Grazing District (Map 1) resulted in tracks of striped skunk at 30 stations, red fox at 17, cottontail species at 6, American badger at 4, and the following at 1 station each: coyote, bobcat, jackrabbit species, raccoon, and domestic cat, from a total of 150 bait station-nights. (Table 1).

The annual survey in the Ardmore area (Map 2) resulted in swift fox tracks at a 18 bait stations over the three nights, out of a possible 93 bait station-nights, striped skunk at 7, jackrabbit species at 1, and long-tailed weasel at 1 (Table 2). Only one year out of the 6 past years has yielded fewer swift fox tracks (12 stations with tracks in 1997). A possible explanation for the low yield of tracks is that the active den found in the area had only two fox living in it—an adult male and a juvenile.

In the past three years, only one swift fox track had been found on the routes in the southern half of the survey area. One track was found again this year, but at a station that is only 1 mile from the active den, and is probably well within the hunting range of the male from that den. Although there were two distinct swift fox tracks in the sand, the bait was left untouched. This could have been a visit by a fox that was full, or a fox that doesn't like mackerel. Perhaps additional bait needs to be used in case the latter is the correct explanation.

Bait Station	Day 1	Day 2	Day 3
1		SYSP	
2			
3			
4		VUFU	VUFU
5	VUFU	VUFU	VUFU
6	VUFU	VUFU	VUFU
7	VUFU	VUFU	VUFU
8	MEME		MEME
9		MEME	MEME
10			
11			
12			
13		MEME	
14			
15		VUFU	MEME
16	MEME	VUFU	VUFU
17		MEME	MEME
18		MEME	
19	VUFU	FERU	VUFU
20		CALA	VUFU
21		MEME	MEME
22			MEME

23	MEME	MEME	TATA
24			
25			
26	SYSP	SYSP	SYSP
27	MEME, TATA	PRLO	
28	SYSP	MEME, FEDO	MEME
29			MEME
30		SYSP	
31			
32			
33		MEME	
34		TATA	TATA
35			
36			
37			
38			
39			MEME
40			
41			
42			
43	MEME	MEME	MEME
44			
45			
46	LESP		
47	MEME	MEME	MEME
48			MEME
49			MEME
50		MEME	

TABLE 1. Tracks on Indian Breeding Bird Route

- VUFU – red fox
- MEME – striped skunk
- CALA – coyote
- TATA – American badger
- LESP – jackrabbit species
- SYSP – cottontail species
- PRLO – raccoon
- FERU – bobcat
- FEDO – domestic cat

Bait Station	Day 1	Day 2	Day 3
1			VUVE
2			
3			
4			
5		MEME	MEME
6			
7			
8			
9			
10			
11			
12			
13			
14	MUFR		
15			
16			
17	MEME		
18	MEME		VUVE
19		VUVE	VUVE
20		VUVE	VUVE
21			VUVE
22		VUVE	VUVE
23		VUVE	VUVE
24		VUVE	VUVE
25	MEME		MEME
26			
27			VUVE
28		VUVE	VUVE
29			VUVE
30		VUVE	MEME
31			LESP

TABLE 2. Tracks on Ardmore Area Swift Fox Survey Route

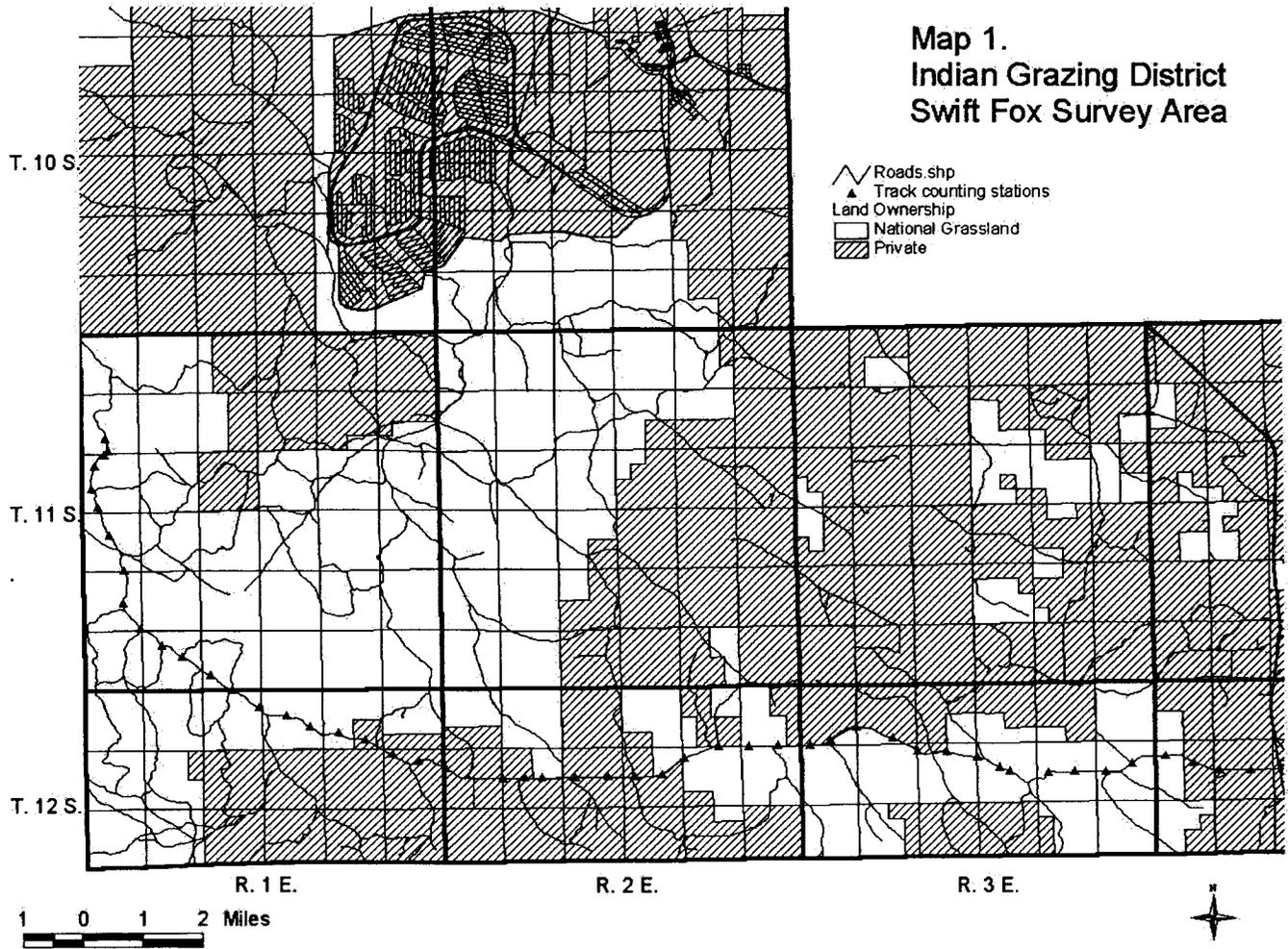
VUVE – swift fox

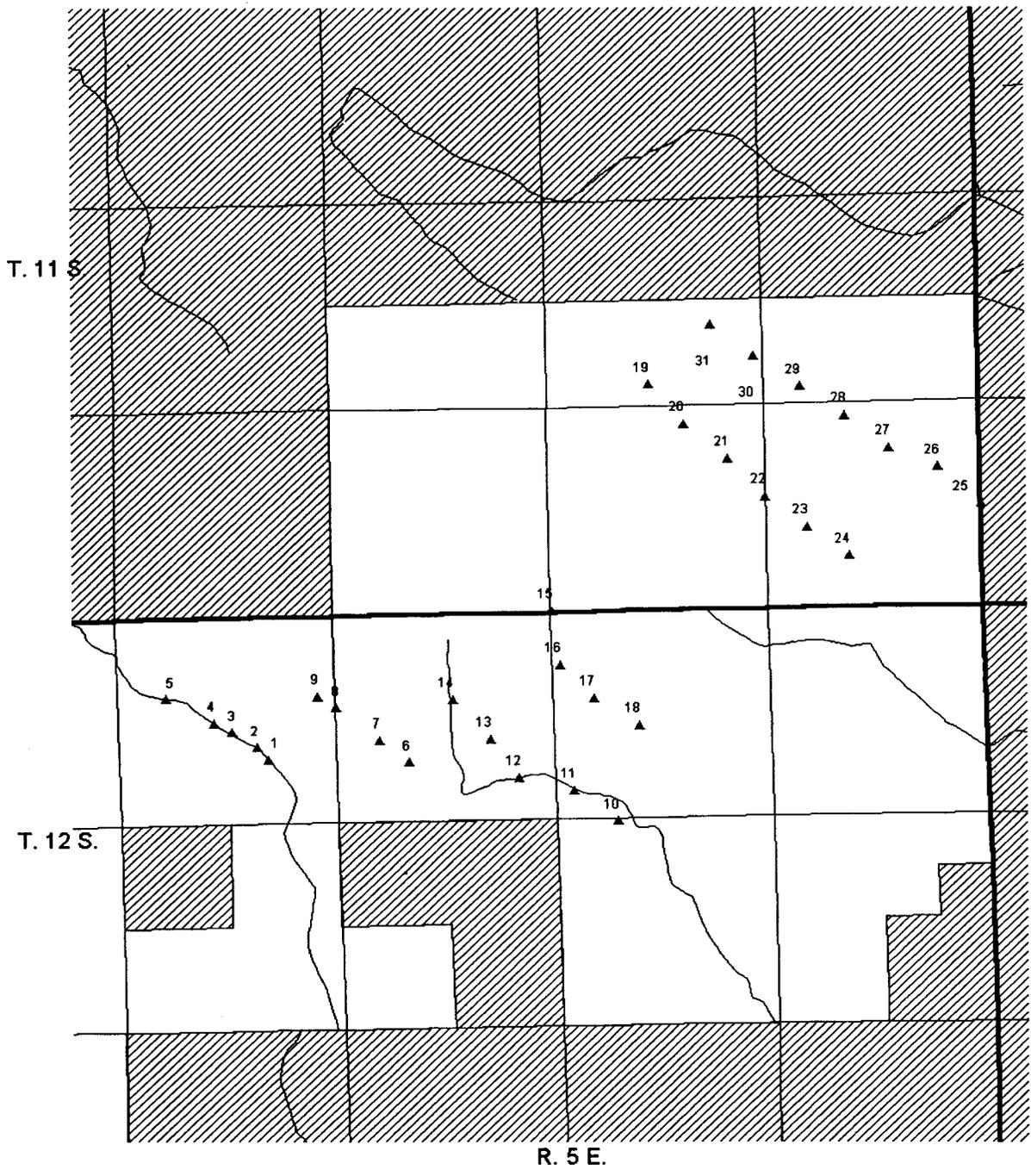
MEME – striped skunk

LESP – jackrabbit species

MUFR – long-tailed weasel

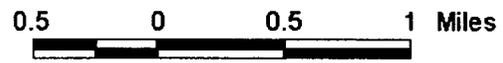
# Map 1. Indian Grazing District Swift Fox Survey Area





Map 2.  
Ardmore Area

- ▲ Track Counting Station
- Roads
- Land Ownership
- National Grassland
- ▨ Private



## A LITERATURE REVIEW OF SWIFT FOX DIET AND PREY DENSITY STUDIES

Robert L. Harrison, Department of Biology, University of New Mexico, Albuquerque, NM 87131

The purpose of this report is to review available swift fox (*Vulpes velox*) diet and prey density studies. This knowledge is valuable for the management of existing swift fox populations and for reintroduction programs. Swift fox are opportunistic predators. Mammals, birds, and invertebrates form the largest proportion of their diets. Mammals are consistently used throughout the year, while birds and invertebrates are consumed seasonally as available. Leporids were the most common prey reported in some areas, while rodents dominated in others. Prey density has been found to correlate with kit fox (*Vulpes macrotis*) population density, reproduction, home range size, home range overlap, mortality, and survival (White and Ralls 1993, White and Garrott 1997, Cypher et al. 2000). Swift fox prey density has not been well studied. At present, it is not possible to generate guidelines for interpretation of different levels of prey density.

This report contains three sections: a summary of information on swift fox diet, a review of surveys of prey density, and a discussion. I include both published and unpublished reports. I thank Julianne Whitaker Hoagland for reviewing this report.

### SWIFT FOX DIET STUDIES

In this section I describe existing swift fox diet studies, proceeding from south to north. Prey species found are listed in the Appendix. A brief overview of study results is presented in the discussion.

Cutter (1958) examined 250 scats and 12 stomachs in northern Texas from spring to autumn. The most frequent prey items were leporids, passerine birds, Orthoptera (grasshoppers), and Coleoptera (beetles). Kilgore (1969) examined 488 scats and 7 stomachs obtained in the Oklahoma panhandle from February through May and in August. He found mammals, especially leporids, to be the most important food resource by biomass of the individual prey, followed by rodents and birds. Invertebrates were common in scats, but comprised less than 2% of ingested biomass.

Kitchen et al. (1999) compared swift fox and coyote (*Canis latrans*) diets using 659 scats collected throughout the year in southeastern Colorado. All rodent species present in the shortgrass prairie habitat of their study area were consumed, with the exception of Colorado chipmunk (*Eutamias quadrivittatus*). Rongstad et al. (1989) examined 582 scats, also in southeastern Colorado. Mammals were the most important food resource, making up over half of scat volume for seven months of the year. Insects and birds were the second and third most important resources. Rongstad et al. (1989) noted large variation between months, years, and family groups. They examined predation on black-tailed jackrabbits (*Lepus californicus*), using radio collared jackrabbits. No jackrabbits were known to be killed by swift fox. Rongstad et al. (1989) also examined the use of cattle carrion by placing dead cows within the home ranges of two swift foxes. There was no indication that the swift foxes used the carcasses. Rongstad et al. (1989) speculated that swift fox may have not used jackrabbits and cattle carrion in order to avoid coyotes.

Zumbaugh et al. (1985) examined 142 stomachs of swift fox harvested in winter along the Colorado-Kansas border. Mammals, especially leporids, occurred most frequently and made up most of the volume. Bird and carrion remains were second. Insects and plants were frequently found, but only in small amounts. Cameron (1984) examined 765 scats collected throughout the year in northeastern Colorado. Leporids constituted the largest scat volume throughout the year, even when other prey were eaten in greater frequency. Invertebrates occurred frequently, but provided little volume.

Sovada et al. (2001) examined 215 scats in cropland and rangeland landscapes in western Kansas from March through December. Mammals and arthropods occurred most frequently, followed by birds, carrion, plants, and reptiles. No differences were found between landscapes for overall occurrence of mammals, arthropods, or carrion in any season. Plains pocket gopher (*Geomys bursarius*) and heteromyid rodents were consumed more frequently in rangeland than cropland. Commercial sunflower seeds were consumed more in cropland than rangeland in spring, and birds were consumed more in cropland than rangeland in fall.

Hines and Case (1991) examined 52 scats in Nebraska collected from January through August. The prey most frequently found were jackrabbits (*Lepus spp.*), rodents, Orthoptera, and Coleoptera. Cattle remains were found in 56% of scats. Hillman and Sharps (1978) collected prey remains at dens in western South Dakota from spring to autumn. They suggested that prairie dogs (*Cynomys ludovicianus*) were important during spring and summer. Uresk and Sharps (1986) gathered scats at dens in western South Dakota from May through September. No sample size was given. They found the most frequent remains to be those of mammals, followed by insects and plants. Food categories were consumed in different proportions between years.

Olson (2000) analyzed 1,173 scats gathered at dens. Mammal remains occurred in over 97% of scats. The diet was not dominated by any particular mammalian prey. Insect remains occurred in 47-80% of scats, and bird remains occurred in 11-33% of scats, depending upon the season. Swift foxes were able to use all prey species regardless of vegetation type, because all species were found in all vegetation types. There was diet variation between swift fox family groups.

Zimmerman (1998) examined contents of 65 scats collected in spring, summer, and fall in northern Montana. Mammals were the most common prey item, followed by insects, vegetation, and birds. Pruss (1994) observed prey cached or brought to dens in southeastern Alberta and southwestern Saskatchewan during the kit-rearing season. Ground squirrels (*Spermophilus richardsonii*), white-tailed jackrabbits (*Lepus townsendii*), and voles (*Microtus spp.*) were the most commonly seen prey.

Seasonal variation of swift fox diet has been described in seven studies. In Oklahoma, Kilgore (1969) found that mammals constituted the largest biomass of prey in both February through April and August, but bird biomass was less in August than in February-April. Invertebrate biomass was highest in August. Plant biomass was highest in January-February, and lowest in March-May.

In southeastern Colorado, Kitchen et al. (1999) found that mammals constituted the major part of swift fox diets from October to July, based on scat volume. Insect remains constituted the largest volume in

August and September. Also in southeastern Colorado, Rongstad et al. (1989) found a higher volume of mammals in October- April than in May-September. Bird volume was much higher in May-June than in the rest of the year. Invertebrate volume peaked in August-September, and was lowest in March and October. Vegetation volume was sporadic throughout year, and never more than 1.2%. Snakes were present only from June through September.

In northeastern Colorado, Cameron (1984) found leporid remains in over 90% of scat collected in all four seasons. Rodent and bird frequencies were lowest in fall and highest in summer. Insect frequencies were lowest in summer, and highest in fall. Vegetation was lowest in winter and highest in fall and spring.

In Nebraska, Hines and Case (1991) found mammal remains in all scats gathered from January through August. Bird and invertebrate remains were lowest in January-February and highest in June-August.

In Wyoming, Olson (2000) found mammalian remains to be nearly ubiquitous throughout the year. The frequencies of ground squirrel, bird, insect, and plant remains were highest in summer and lowest in winter. In Montana, Zimmerman (1998) found mammal remains in about 90% of scat in each of spring, summer, and fall. Insect frequency increased from spring to fall. Bird and plant frequency decreased from spring to fall. She did not report any leporid remains in scat, which is suspicious.

#### SWIFT FOX PREY DENSITY STUDIES

In this section I describe the results of studies of prey density. Five studies described were conducted with swift fox present (Sharps 1980, Covell 1992, Klausz 1997, Olson 2000, Sovada et al. 2001). Two studies were evaluations of reintroduction sites (Knowles 1998, Kunkel et al. 2001). One additional study (Mamo 1994) surveyed areas both with and without swift foxes.

Covell (1992) used snap traps for small mammals in fall and spotlight surveys for leporids from June-October to index major swift fox prey in southeastern Colorado. His study area was the ungrazed Pion Canyon Maneuver Site. It was dominated by blue grama (*Bouteloua gracilis*), galleta (*Hilaria jamesii*), western wheatgrass (*Agropyron smithii*), cholla (*Opuntia imbricata*), and yucca (*Yucca*). Small mammal capture rate averaged 6.1%. Black-tailed jackrabbits and desert cottontails (*Sylvilagus auduboni*) combined averaged 0.75/km. No significant differences in small mammal or leporid densities between areas with male-female pairs and areas with male-female pairs plus female helpers were found.

Sovada et al. (2001) used spotlighting to count Ord's kangaroo rats (*Dipodomys ordii*), cottontail rabbits (*Sylvilagus spp.*), and black-tailed jackrabbits in cropland and rangeland landscapes in western Kansas. Most cropland fields were in a dryland winter wheat-fallow rotation. Rangeland was dominated by buffalo grass (*Buchloe dactyloides*), blue grama, and hairy grama (*B. hirsuta*). They observed an average of 0.11/km and 0.06/km for kangaroo rats, 0.02/km and 0.01/km for cottontail rabbits, and 0.07/km and 0.06/km for jackrabbits in rangeland and cropland, respectively.

Olson (2000) conducted the most thorough study of prey density to date, and provided the only detailed comparison of prey density and swift fox ecology. His study area was in southeast Wyoming, in

grassland interspersed with low growing sagebrush (*Artemisia tridentata*) and greasewood (*Sarcobatus vermiculatus*). Primary grasses were buffalograss, blue grama, needle-and-thread (*Stipa comata*), western wheatgrass, and prairie junegrass (*Koeleria macrantha*). He used small mammal live traps, transect counts of ground squirrel burrows, transects of bird sightings, and pitfall traps for ground dwelling insects in summer. He assigned ranks to vegetation types for each prey type, and added the ranks for each prey type to obtain a composite ranking for prey relative abundance in each vegetation type. The most common vegetation types in his study area were greasewood, sagebrush, sagebrush/grassland, grassland, and playa lake. Trap success was highest in greasewood (17% in 1998, 8% in 1999), and second in sagebrush (15% in 1998, 7% in 1999). Small mammals captured were deer mouse (*Peromyscus maniculatus*), northern grasshopper mouse (*Onychomys leucogaster*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), Wyoming pocket mouse (*Perognathus fasciatus*), least chipmunk (*Tamias minimus*), and voles. Mean number of ground squirrel burrows did not differ between vegetation types (average approximately 2.5 burrows/100m). Birds were most abundant in greasewood (3.3 birds/100 m), followed by sagebrush (2.8 birds/100 m). The birds most frequently observed were horned lark (*Eremophila alpestris*), Brewer's sparrow (*Spizella breweri*), McCown's longspur (*Calcarius mccownii*), and vesper sparrow (*Pooecetes gramineus*). There was no significant difference between the numbers of beetles captured among vegetation types, although the highest numbers were in sagebrush/grassland (5 beetles/5 trap grid) and sagebrush (4 beetles/5 trap grid). Prey relative abundance composite rankings were: sagebrush 12, greasewood 11, sagebrush/grassland 10, grassland 6, and playa lake 6 (highest ranking indicates highest relative abundance). There was no evidence for selection by swift foxes of vegetation types within home ranges, except that swift foxes used sagebrush less than expected during pup rearing in 1998. Although greasewood was second highest for prey abundance, it ranked lowest for security due to high vegetation obscuring vision. Greasewood was never used more than expected by swift foxes. Swift foxes with a larger proportion of sagebrush in home ranges were observed with more young, but dead swift foxes were found more often in sagebrush.

Sharps (1980) surveyed birds with observations on transects, insects with pit traps, and grasshoppers with walking transects. He also surveyed small mammals, but small sample size and robbing of traps by swift fox invalidated the results. He had two study areas in Shannon and Haakon counties, South Dakota. Dominant vegetation was buffalograss, needleleaf sedge (*Carex eleocharis*), blue grama, and western wheatgrass. All surveys were done near natal dens. Meadowlarks (*Sturnella neglecta*) and chestnut-collared longspurs (*Calcarius ornatus*) were the most abundant birds. Mourning doves (*Zenaidura macroura*) and horned larks were next, with redwinged blackbird (*Agelaius phoeniceus*) and lark bunting (*Calamospiza melanocorys*) least abundant of the bird species identified. During June through August, meadowlark populations remained stable, while mourning dove and chestnut-collared longspurs declined in numbers. Orthopteran density varied from approximately 44,000/ha in 1978 to 98,136/ha in 1979. Coleopteran density was 6,770/ha in 1978.

Klausz (1997) examined the winter density of small mammals in southern Alberta and Saskatchewan, within the range of reintroduced swift fox. Her study areas contained three habitat types: upland, coulee, and roadside. Upland habitat was flat to gently rolling with vegetation low and sparse. The most common plants were needle-and-thread, blue grama, and northern and western wheatgrass. Upland habitat had the least snow cover of the three types. Coulee habitat consisted of gentle to steep-sided

valleys where vegetation was often dense and diverse. Wild rose (*Rosa acicularis*), wild mustard (*Glycyrrhiza lepidota*), sagebrush, and golden aster (*Chrysopsis villosa*) dominated. In roadside habitat, vegetation was tall and primarily crested wheatgrass (*Agropyron cristatum*). Litter depth was greatest in coulee habitat, followed by roadsides, then uplands. Overall, Klausz (1997) trapped 157 deer mice and six shrews (*Sorex spp.*) in 9360 trap-nights (1.8%). Capture rates declined about 90% from early to late winter. In upland habitat in early winter, deer mouse density was estimated to be 0, 1.3, and 3.0/ha in three different study areas.

Kunkel et al. (2001) examined the feasibility of reintroducing swift fox on a private ranch in west-central South Dakota. Dominant grasses were western wheatgrass and needlegrass (*Stipa viridula*). They used small mammal live traps, road transects for leporids, walking transects for grasshoppers, and visual counts of prairie dogs in towns. Small trapping success was 9.7%. Fall small mammal density was estimated to be 33/ha. Deer mice accounted for 81.6% of captures. Other species captured were white-footed mouse (*Peromyscus leucopus*), western harvest mouse (*Reithrodontomys megalotis*), plains harvest mouse (*Reithrodontomys montanus*), prairie vole (*Microtus ochrogaster*), meadow vole (*Microtus pennsylvanicus*), meadow jumping mouse (*Zapus hudsonicus*), hispid pocket mouse (*Perognathus hispidus*), and shorttail shrew (*Blarina brevicauda*). Averages of 0.58 white-tailed jackrabbits/km<sup>2</sup>, 0.10 eastern cottontails (*Sylvilagus floridanus*)/km<sup>2</sup>, and 0.29 grasshoppers/m<sup>2</sup> were observed. The overall prairie dog density on the ranch was estimated to be 0.40/ha.

Knowles (1998) evaluated a private ranch on the Blackfeet reservation in Montana as a swift fox reintroduction site. The area was dominated by needle-and-thread, blue grama, western wheatgrass, and threadleaf sedge (*Carex filifolia*). He used small mammal live traps and transect counts of ground squirrel burrows. Deer mice were the only nocturnal small mammal captured, averaging 4.6% trap success. No voles were found. He found 9.8 ground squirrel burrows/km. Burrow densities ranged from 1.6 to 17 burrows/ha. Knowles (1998) stated without justification that the small mammal population appeared to be typical for needle-and-thread /blue grama habitat.

Mamo (1994) surveyed four areas in southern Alberta and Saskatchewan. Swift fox were present in the Milk River area, but the other three areas (Alberta/Saskatchewan border, Scots Lake, Tide Lake) were evaluated as potential release sites. Grasses in Milk River and Tide and Scots Lakes were dominated by spear grass (*Stipa comata*) and blue grama. In the Alberta/Saskatchewan border area, the dominant grasses included wheat grasses (*Agropyron spp.*), June grass (*Koeleria cristata*), spear grass, Sandberg's blue grass (*Poa secunda*), blue grama, Canby blue grass (*Poa canbyi*), and mild barley (*Hordeum jubatum*). Mamo (1994) counted rabbits and rabbit pellets, ground squirrel burrows, small birds, small mammals and other small mammal sign, and droppings of deer and pronghorn (to measure potential carrion abundance) along transects one kilometer long and two meters wide. He also rated the abundance of insects on a scale of one to five (one = uncommon). In general, prey densities were highest at Tide Lake (7.6 rabbit signs, 5.9 ground squirrel holes, 29.5 small mammal signs, and 20.1 small birds per transect). The border area had the highest insect rating (3.3) and large mammal sign abundance (6.6 per transect). The lowest prey abundance in four of the six categories was at Milk River (3.2 rabbit signs, 0.8 ground squirrel holes, 12.4 small mammal signs, and 1.2 large mammal signs per transect). Tide Lake had the lowest insect rating (2.3) and large mammal sign abundance (1.2 per transect).

## DISCUSSION

Mammals, birds, and invertebrates form the largest proportion of swift fox diets. Mammals are consistently used throughout the year, while birds and invertebrates are consumed seasonally as available. Among mammals, leporids were reported as the most common prey by Cutter (1958), Kilgore (1969), Cameron (1984), Zumbaugh et al. (1985), and Sovada et al. (2001). Rodents were reported to be the most common mammal prey by Hines and Case (1991, Muridae), Uresk and Sharps (1986, Sciuridae), Rongstad et al. (1989, Geomyidae and Heteromyidae), Zimmerman (1998, Muridae), and Olson (2000, Sciuridae, Cricetidae). Carrion is consumed, and has been reported to occur in up to 38% of scats (Hines and Case 1991). Vegetation remains in scats are usually reported in trace amounts, but vegetation that could not be consumed incidentally and large volumes of vegetation occasionally found in scat indicate that swift fox do deliberately consume plant material (Hillman and Sharps 1978, Uresk and Sharps 1986, Kitchen et al. 1999, Sovada et al. 2001). Reptiles, amphibians, and other resources are consumed only occasionally.

Existing diet studies have made it quite clear that swift fox consume a tremendous variety of mammals, birds, reptiles, and invertebrates (Appendix). For this reason, they have often been considered an opportunistic predator (Kilgore 1969, Scott-Brown et al. 1987, Hines and Case 1991, Klausz 1997, Olson 2000). However, to be considered an opportunistic predator, it must be shown that a species consumes prey in proportion to its abundance. There is good evidence that swift fox are indeed opportunistic predators. Several authors have noted that the frequencies of birds, insects, and vegetation in scats generally follow seasonal trends of availability (see above). Kilgore (1969) found that the relative frequency of selected rodents and shrew remains in his scat sample was very similar to their relative capture rates in snap-traps. Olson (2000) found that prey remains in scats varied through the year, generally tracking the relative abundance of each. Occurrence of pronghorn (*Antilocapra americana*) in scats peaked in fall and winter, when pronghorn that died during hunting season and winter were most available as carrion. However, ground squirrel remains were found in scat during dispersal and pair formation periods when ground squirrels were hibernating, possibly as a result of caching (Pruss 1994). Sovada et al. (2001) found eggshell fragments in scats collected in fall, also suggesting that swift fox cache food. Sovada et al. (2001) found remains of Ord's kangaroo rats more frequently in scat from rangeland than cropland, agreeing with their spotlight observations that kangaroo rats were more abundant in rangeland.

There has been no evidence that swift fox are in any sense an obligate predator, ie., dependent upon only a few food resources (Olson 2000). There is evidence that kit foxes retain a preference for small mammals and do not shift to other prey even when small mammals were scarce (White et al. 1996). Also, Egoscue (1975) found that kit foxes in Utah did not shift to alternate prey, even though they were available, when numbers of their primary prey (black-tailed jackrabbits) declined.

It should be noted that none of the studies cited here used controlled methods to identify prey remains in scats or stomachs. Some authors used reference collections or guides such as Moore et al. (1974), while other authors did not explain their methods at all. No study used blind tests of known specimens to test their methods. Such lack of control may result in significant identification errors (Spaulding et al. 2000; R. Harrison, in review, Wildlife Society Bulletin). Although lack of controls probably had little effect

upon the general results reported, conclusions regarding individual prey species may have been compromised.

In contrast to diet studies, there have been few prey density studies. Small mammal trapping success has been examined the most consistently and results range from 1.8% in winter (Klausz 1997) to 17% in summer (Olson 2000). One would expect areas without foxes to have higher small mammal densities than areas with foxes, as found by Harrison and Schmitt (1997). Comparisons between studies are of limited value due to habitat differences, but Kunkle et al.'s (2001) results in an area without swift foxes were comparable to those of Covell (1992) and Olson (2000) with swift foxes present, whereas with the exception of Klausz's (1997) winter results, Knowles' (1998) trap success in an area without swift foxes rate was the lowest found. In Mamo's (1994) study of areas with and without swift foxes, the area with foxes did have the lowest prey abundance in four of six categories. Burrow counts, pitfall traps, and bird surveys have not been done enough for even limited comparisons.

The methods used to date appear to be adequate, but there are no guidelines available to interpret the significance of different levels of prey density. Kit fox prey densities observed by Cypher et al. (2000) varied by a factor of five over the course of eleven years, suggesting that swift fox prey density may also vary significantly from year to year. They also found that prey indices were highly correlated with precipitation. Future swift fox prey density studies should include information about the level of precipitation when the study was done, not just annual averages.

To obtain a complete and useful picture of the importance of prey density to swift fox, studies of prey density must be done simultaneously with studies of land use, vegetation, climate, soils, other carnivores, and other factors which influence prey ecology as well as swift fox ecology (Olson 2000). There is a great need for a long-term study of swift fox similar to the kit fox study of Cypher et al. (2000).

#### LITERATURE CITED

- Cameron, M. W. 1984. The swift fox (Vulpes velox) on the Pawnee National Grassland: Its food habits, population dynamics and ecology. M.S. Thesis, University of Northern Colorado, Greeley.
- Covell, D. F. 1992. Ecology of the swift fox (Vulpes velox) in southeastern Colorado. M.S. Thesis. University of Wisconsin, Madison.
- Cutter, W. L. 1958. Food habits of the swift fox in northern Texas. *Journal of Mammalogy* 39:527-532.
- Cypher, B. L., G. D. Warrick, M. R. M. Otten, T. P. O'Farrell, W. H. Berry, C. E. Harris, T. T. Kato, P. M. McCue, J. H. Scrivner, and B. W. Zoellick. 2000. Population dynamics of San Joaquin kit foxes at the Naval Petroleum Reserves in California. *Wildlife Monographs* 145:1-43.

- Egoscue, H. J. 1975. Population dynamics of the kit fox in western Utah. *Bulletin Southern California Academy of Sciences* 74:122-127.
- Harrison, R. L., and C. G. Schmitt. 1997. Swift fox investigations in New Mexico, 1997. Pages 97-106 in B. Giddings, ed., *Swift Fox Conservation Team annual report*.
- Hillman, C. N., and J. C. Sharps. 1978. Return of swift fox to northern Great Plains. *Proceedings of the South Dakota Academy of Science* 57:154-162.
- Hines, T. D., and R. M. Case. 1991. Diet, home range, movements, and activity periods of swift fox in Nebraska. *Prairie Naturalist* 23:131-138.
- Kilgore, D. L., Jr. 1969. An ecological study of the swift fox (*Vulpes velox*) in the Oklahoma panhandle. *American Midland Naturalist* 81:512-534.
- Kitchen, A. M., E. M. Gese, and E. R. Schauster. 1999. Resource partitioning between coyotes and swift foxes: space, time, and diet. *Canadian Journal of Zoology* 77:1645-1656.
- Klausz, E. E. 1997. Small mammal winter abundance and distribution in the Canadian mixed grass prairies and implications for the swift fox. M. S. Thesis. University of Alberta, Edmonton.
- Knowles, C. J. 1998. An evaluation of the AMS site for reintroduction of the swift fox on the Blackfeet Indian Reservation. Unpublished report to Defenders of Wildlife.
- Kunkel, K., K. Honness, M. Phillips, and L. N. Carbyn. 2001. Feasibility of restoring swift fox to west-central South Dakota. Unpublished report to Turner Endangered Species Fund.
- Mamo, C. C. 1994. 1994 Swift fox habitat survey. Unpublished report prepared for Alberta Fish and Wildlife Services.
- Moore, T. D., L. E. Spence, and C. E. Dugnolle. 1974. Identification of the dorsal guard hairs of some mammals of Wyoming. Wyoming Game and Fish Department, Cheyenne, WY.
- Olson, T. L. 2000. Population characteristics, habitat selection patterns, and diet of swift foxes in southeast Wyoming. M. S. Thesis. University of Wyoming, Laramie.
- Pruss, S. D. 1994. An observational natal den study of wild swift fox (*Vulpes velox*) on the Canadian Prairie. Master of Environmental Design Thesis, University of Calgary, Alberta.
- Rongstad, O. J., T. R. Laurion, and D. E. Anderson. 1989. Final Report. Ecology of swift fox on the Pinon Canyon Maneuver Site, Colorado. Unpublished report submitted to Directorate of Engineering and Housing, Fort Carson, Colorado.

- Scott-Brown, J. M., S. Herrero, and J. Reynolds. 1987. Swift fox. Pp. 433-441 in M. Novak, J.A. Baker, M.E. Obbard, and B. Malloch, eds., *Wild Furbearer Management and Conservation in North America*. Ministry of Natural Resources, Ontario, Canada.
- Sharps, J. 1980. Critical habitat and food habits of the swift fox (Vulpes velox). Final Report. U.S. Forest Service Rocky Mountain Forest and Range Experiment Station, Cooperative Agreement No. 16-817-CA, Research Work Unit No. 1752.
- Sovada, M. A., C. C. Roy, and D. J. Telesco. 2001. Seasonal food habits of swift fox (*Vulpes velox*) in cropland and rangeland landscapes in western Kansas. *American Midland Naturalist* 145:101-111.
- Spaulding, R., P. R. Krausman, and W. B. Ballard. 2000. Observer bias and analysis of gray wolf diets from scats. *Wildlife Society Bulletin* 28:947-950.
- Uresk, D. W., and J. C. Sharps. 1986. Denning habitat and diet of the swift fox in western South Dakota. *Great Basin Naturalist* 46:249-253.
- White, P. J., and R. A. Garrott. 1997. Factors regulating kit fox populations. *Canadian Journal of Zoology* 75:1982-1988.
- White, P. J., and K. Ralls. 1993. Reproductive and spacing patterns of kit foxes relative to changing prey availability. *Journal of Wildlife Management* 57:861-867.
- White, P. J., C. A. V. White, and K. Ralls. 1996. Functional and numerical responses of kit foxes to a short-term decline in mammalian prey. *Journal of Mammalogy* 77:370-376.
- Zimmerman, A. L. 1998. Reestablishment of swift fox in north central Montana. M. S. Thesis. Montana State University, Bozeman.
- Zumbaugh, D. M., J. R. Choate, and L. B. Fox. 1985. Winter food habits of the swift fox on the central high plains. *Prairie Naturalist* 17:41-47.